axiohe

axm935

Optical Mark Reader with Manual Document Feed

Technical Operating and Service Manual

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1 Introduction

1.1 About this manual

This manual is intended for use by service personnel.

- **Part 1** provides information about
  - unpacking and storing the device and device related safety information
  - connection to the mains source and authorization as well as
  - the requirements on the operating environment.
- **Part 2** informs you about the main mode of operation of the document reader and provides tips on operation.
- **Part 3** describes the setting up and installation of the axm935.
- **Part 4** shows how you can increase the reading reliability of the axm935 by mechanical adjustments and cleaning procedures.
- **Part 5** describes the functions of the test program "OMR-Test".
- **Part 6** shows how disorders can be eliminated by replacing defective parts.
- **Part 7** contains the document specifications and information on the marks.
- **Part 8** lists the wearing parts and the spare parts.

1.1.1 Typographical notes

! This symbol calls your attention to particular items that absolutely must be observed.

♦ This symbol always appears before process sequences and it simultaneously indicates the chronological sequence.

1.2 Information about unpacking the mark reader

The box inside the packaging contains the document output tray.

- Grasp the reader by the filling materials mounted on the left and right sides of the device and lift it carefully, straight upwards out of the cardboard box without tilting it. The device weighs about 6 kg.

- Set the reader down on the intended work surface and remove the two pieces of filling material on the sides.

! When setting up the reader, take care not to grasp the device at the top near the (closed) scanner cover but only at the back housing cover and below at the base plate.
The scanner cover is not locked! It could swing open dangerously which might result in the device falling out of your hands onto the work surface!

♦ Remove the output tray from the packaging and place it to the right of the reader on the work desk.

You can read about how to set up the reader and how to mount the output tray in section 3.1.

! Save the entire original packing for later transportation and shipping of the mark reader.
Devices that are sent back to suppliers for maintenance or repair work are always returned in their original boxes (possibly at cost of the sender).

1.2.1 Scope of the delivery

Check to make sure that the delivery is complete. All accessories required for the connection and operation of the axm935 are included in the delivery:

- mains cable
- data cable
- CD ROM with installation software and manual
- hexagon socket screw key 1.5 mm

If something is missing or if damages occurred during transportation, please contact your supplier.

1.3 Device related safety information

1.3.1 Conformity

The axm935 reader conforms to the CE standards and guidelines for data processing devices (design according to VDE 0805/5.90, interference suppression according to VDE 0871-B). It can be operated continuously under normal room conditions.

1.3.2 Precautionary measures for transportation, storage and installation

Please observe the following points regarding the transportation and installation of the reader:

Transportation and storage

- Transportation of the reader should only be effected in the original packing. It protects against shocks and inadmissible strains on the mechanical parts.
- Please take the ambient conditions into consideration when transporting or storing the reader.

Mains connection and authorization

- The reader may only be operated when connected to a grounded shockproof outlet. Industrially operated mains networks often exhibit substantial, load-dependent interference peaks (powerful motors, electrical welding plants, etc.). The axm935 reader is protected against such interference to a great extent, but if interference is present, try to use a network used for EDP or select a mains supply that is free of interference.
- Never open the housing of the reader and never remove any housing parts.
- Always turn the reader off via the mains switch before carrying out any adjustments or cleaning operations.
- It is forbidden to effect changes or modifications to the reader that are not stated in this manual. The manufacturer of the device will decline any form of guarantee demand and will not accept any service clauses if it can be demonstrated that the reader was manipulated or damaged by unauthorized persons.

1.3.3 Selection of the work site

Take care to assure that the axm935 is exposed to appropriate operating conditions. This is important in assuring faultless functioning of the reader:

- The reader must stand on a stable, horizontal and level surface. It requires a surface area of 450 x 220 mm as working space; the reader weighs 6.2 kg. Vibrations at the work site should be avoided.

- Check to assure that the device is shielded as extensively as possible against sources of heat such as direct sunlight, radiators, spotlights or other sources of light that produce heat.
  Sunlight or foreign sources of light applied to the scanning unit under unfavorable circumstances may also have an influence on the read sensitivity.
- The permissible relative humidity amounts to 40 - 60%, condensation-free.
- It must be possible to lay all cables (mains cable and data cable) without buckling and without tensile stress. Take care to identify stumbling pitfalls.
- The axm935 corresponds to the requirements regarding interference emission and resistance to jamming (ESD) as specified by the CE guidelines. In order to assure complete interference immunity, shielded data cables with connector casings of metal or with metallic connector casings must be used.
- Take care that the device is not operated in surroundings that are contaminated by dust or oil. Air currents caused e. g. by windows that are continually left open, by passageways or ventilators, may lead to the increased production of dust and this in turn may necessitate shorter maintenance and cleaning intervals.
- The work site must afford sufficient space for the handling of the documents.

2 The axm935 mark reader

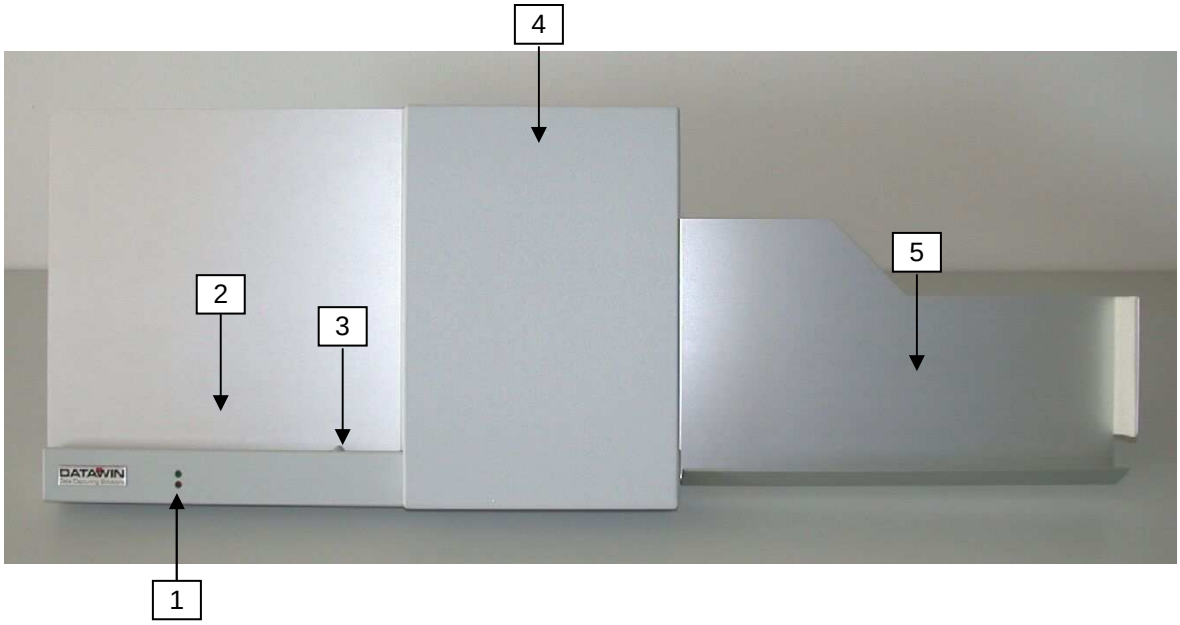
This chapter provides brief information about the performance characteristics and the basic mode of operation of the mark reader.

2.1 Design

The axm935 mark reader is an optical mark reader designed for manual feed. It reads marks, crosses, bars, dots and various other types of markings. It processes automatically printed documents (e. g. laser printouts) as well as blind color forms and qualitatively high-grade (dimensionally accurate) copies. The read head can be folded back without the use of tools in order to carry out cleaning or maintenance operations.

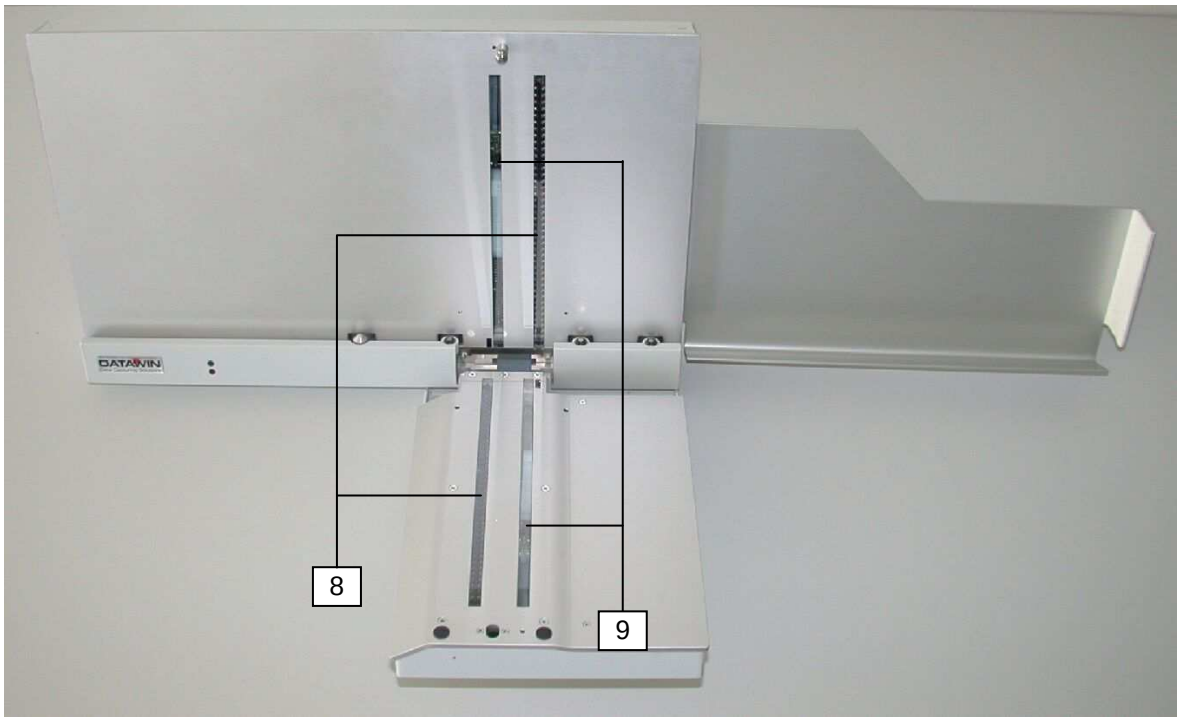
The compact structure of the device allows it to be positioned at a slant as an ergonomic desktop model.

This figure shows the axm935 ready for operation:



1 Display of the operating status
2 Document guide
3 Motor-driven document intake
4 Hinged upper scanner cover
5 Document output

This figure shows the axm935 with opened scanner cover with two OMR and two bar code read heads:

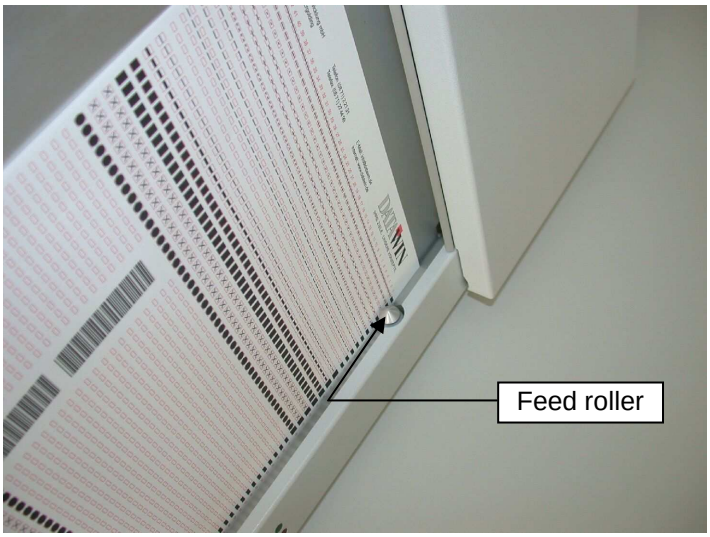


8 Mark scanners (OMR)
9 Bar code read heads

2.2 Document processing

2.2.1 Manual document guidance – automatic document intake

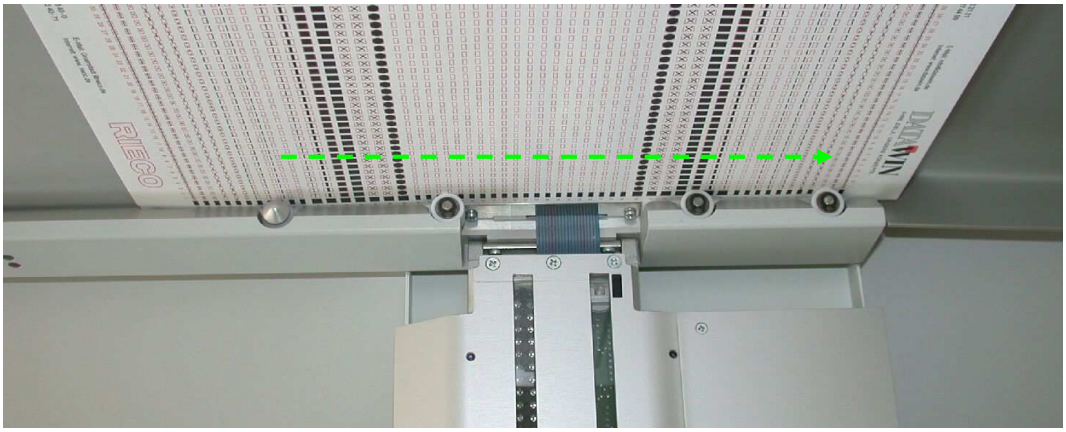
You place an individual document by hand onto the document guide. This triggers a light barrier that starts the transport motor and the document is automatically drawn in across a feed roller.



2.2.2 Transport path

The document that is drawn in is passed on by a transport roller to a read station whereby it passes a second light barrier that in turn activates the read process. The document is transported through the read station by means of two additional rollers. When the end of the document passes the read station this is detected by a third light barrier and the read process terminates.

The transport speed amounts to 800 mm/s. A special profile on the silicone rings of the transport rollers causes the document to always remain exactly flush along the guide piece as it passes through the read station.



The figure shows the document transport path (with opened scanner cover).

2.2.3 Read stations

The mark read head is dustproof and self-cleaning. It operates with red light so that all conventional types of marking media can be employed. As an option, an infrared mark read head for marks made by pencil and OCR signers can be used.

The mark read head processes documents with a mark density of 40 tracks (1/5" interval) or (as an option) 48 tracks (1/6" interval). The read head is insensitive to documents with wrinkles and with “reflecting” marks, it adjusts dynamically to the document colors and gray scale values used and it possesses a dynamic dirt masking feature.

Depending upon the requirements of the application, the axm935 can be equipped with a second OMR read head (for the simultaneous reading of the rear side of the document), with two bar code read heads and – via a mountable scanner – for bar code reading in a crosswise direction.

To protect against dirt, the read stations are located behind protecting glass.

The read heads are visible after the scanner cover has been opened.

2.2.4 Opening and closing the scanner cover

The scanner cover must only be opened to clean the read stations or to perform adjustment operations:

- Open the scanner cover by pushing lightly at the upper end of the document intake. Carefully swing the cover towards the front until it lies on the work desk.
- To close it again, lift the cover towards the front and then swing it towards the back until you hear

that the guide pin of the base plate has latched into place.

! When opening or closing the cover, please do not allow it to fall onto the work surface or backwards onto the base plate of the reader.

2.2.5 Document output

In the event of a faultless read result the document is output in the output tray.

If the read result is poor, the document will be rejected and reported in the display of the operating status (see section 2.2.6). The faulty document is transported through the read station back to the document guide where it can be removed and inserted again for a renewed read attempt.

2.2.6 Display of the operating status

The following table shows the standard displays:

LED		Significance
Red	**Green**	
off	blinking	**Ready** The reader is waiting for a document.
off	steady-burning	After the insertion of a document.
steady-burning	steady-burning	A document has been drawn in, but the data has not yet been called.
off	steady-burning	Document ejection.
Both LEDs blinking **simultaneously**		The LEDs blink until the document has been removed; then "Ready".
Both LEDs blinking **alternately**		Transportation fault, document intake or ejection jam; LEDs blink until the fault is eliminated (remove document); then "Ready".

! It is possible that other operating modes or display statuses are parameterized by the application software. In that case, they are documented in a special software description.

3 Putting the mark reader into operation

This chapter describes how to set up the reader at the work site and how to proceed with the installation – from connection to a host (PC) up to conducting a test run.

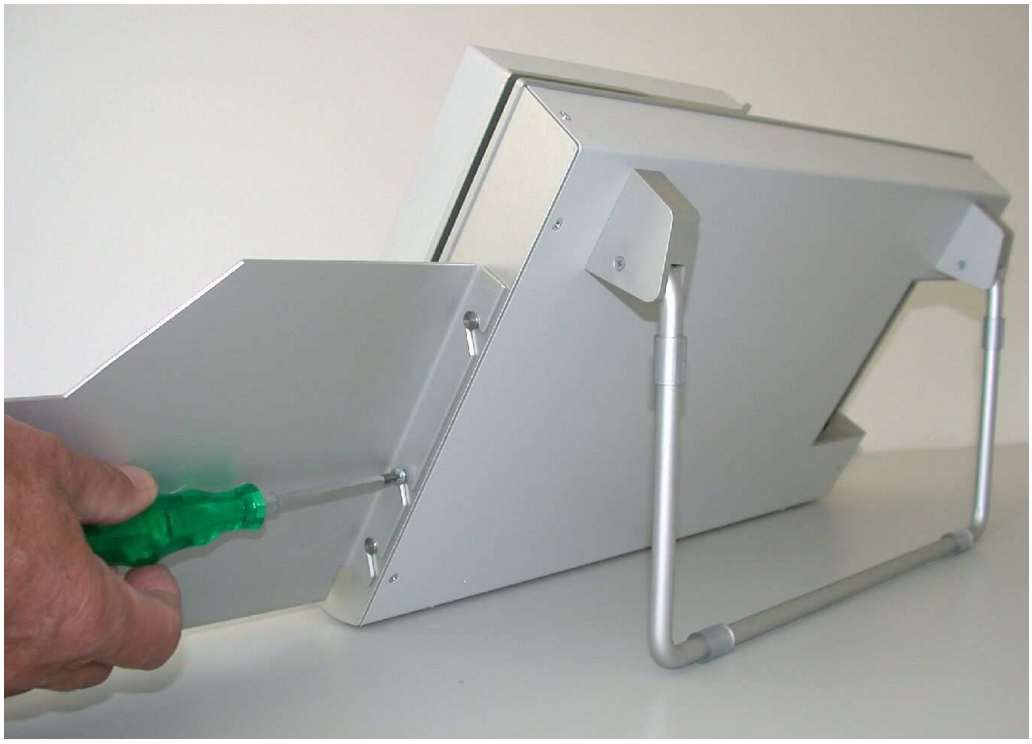
3.1 Setting up the device

The mark reader can be operated either lying flat on the work surface or at a slant in desktop form.

♦ To set up the device at a slant, fold out the support bow at the rear side of the housing.

To assure faultless operation, you must now mount the output tray:

- Place the output tray flush next to the reader so that the two fastening bolts of the reader fit into the corresponding recesses of the output tray. Then tighten the securing screw.



You can then install the reader.

3.2 Mains connection data

The power supply of the axm935 is designed for a wide voltage range from 100 to 240 V ~. The connected load amounts to 20 W.

Normally no special provisions or settings of the voltage supply are required for operation. However, check whether the existing mains voltage actually corresponds to the values on the type plate of the reader.

3.3 Data interface

The serial interface of the reader is executed as a 9-pin socket terminal strip. The simplest connection is a "three-wire" connection without hardware handshake. Bridges on the side of the reader are not necessary. The basic parameterization of the reader supports this operating mode.

	Pin assignments	
Pin	**"three-wire" assignment**	**complete assignment**
Pin 2	TxD	TxD
Pin 3	RxD	RxD
Pin 5	SGND	GND
Pin 6		DTR (+12 V are present after "power on")
Pin 7		CTS
Pin 8		RTS (+12 V are present after INIT)

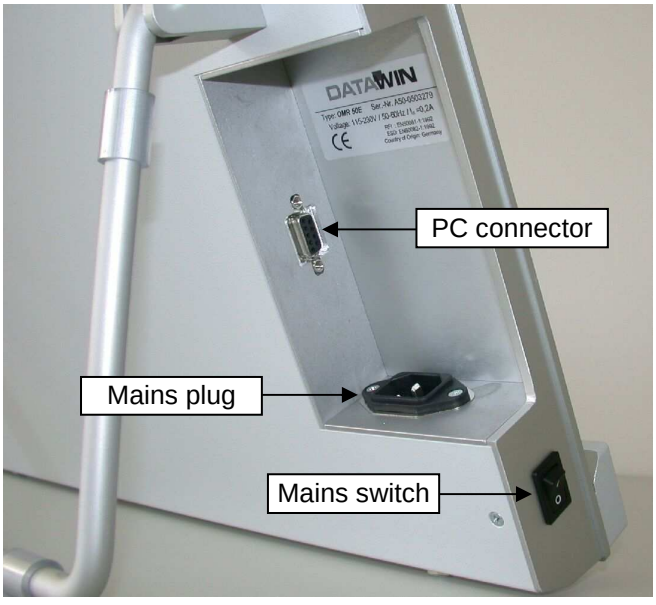
3.4 PC connection

3.4.1 Minimum requirements on the PC

The minimum requirements on the PC are fulfilled nowadays by any commercially available system. If the test program "OMR-Test" is to be installed (see chapter 5) then a CD drive must be connected.

3.4.2 Connecting the reader and the PC

- Run down the operating system of the PC and turn off the PC.
- Connect the mains cable to the connector of the reader and then plug the mains plug into a mains outlet.
- Connect the interface cable to a free RS232 connector of the PC and secure the data connector with the screws provided for that purpose.



- Connect the data cable to the connecting socket of the reader and secure the connector here as well.
- Turn on the reader by means of the mains switch.
- Turn on the PC and run up the operating system.

3.5 Software

The control of the reader is effected by means of device-specific interface firmware and – via the connected PC – by means of read software designed according to the user application.

3.5.1 Interface firmware

The communication between the axm935 and the PC is controlled via the interface firmware, consisting of

- the standard interface and
- the interpreter interface.

How to read out and set the interface parameters is described in separate manuals.

3.5.2 Read software

The read program itself defines the processing of the marks and bar codes that are read out on the PC. This program is always adapted to the respective application of the axm935. How to install this software on your PC and how to work with it is described in a separate manual.

3.6 Testing the read functions

Upon completion of the installation steps the reader is ready for operation and you can test the reading of the marked documents. Check hereby if the reader operates faultlessly and if all the functions are executed in accordance with the intended practical usage. Conduct the test only with documents that you will actually use in practical operation. In this regard, also note the document specifications contained in section 7.3.

The special test program "OMR-Test" is also at your disposal for certain tests and functional settings of the reader. The mode of operation of this test program is described in chapter 5.

3.7 De-installing the reader

- De-install the scanner software on the host PC if it is present.
- Run down the operating system of the PC and turn off the PC.
- Turn off the reader.
- Loosen and unplug the connectors of the data cable at the PC and at the reader.
- Unplug the connectors of the reader mains supply cable.

4 Adjusting and cleaning the reader

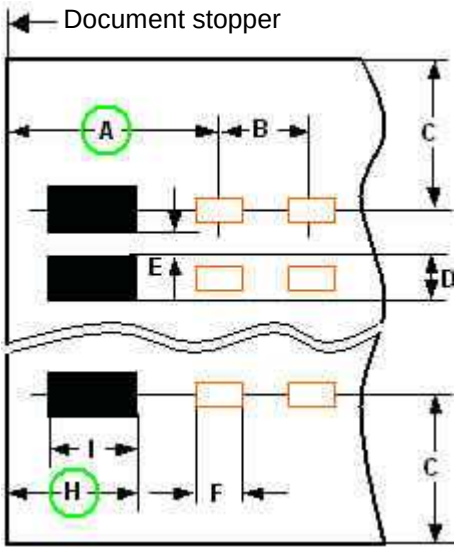
This chapter describes how you can set the document reader by means of simple mechanical adjustments to correspond to the documents to be read. For these operations you will need a hexagon socket screw key (1.5 mm). Moreover, it will be demonstrated how you can increase the read accuracy by simple cleaning operations.

4.1 Setting the OMR read head

In the manufacture and printing of mark documents a particular dimensional field must be exactly adhered to. Besides this, the clock mark track and the marking area must run exactly parallel to the edge of the document that is transported along the document stopper during the read process. On documents that are printed or cut askew, the clock mark track and the marking area are spread across the entire document outside of the dimensional field. These deviations in dimension can be compensated within a certain tolerance range by means of a lateral “shifting” of the OMR scanning strip.

4.1.1 Basic setting "standard document"

The mark scanning is set at the factory to correspond to a "standard document". The table below shows the distances (in mm) based on a sample of 40 track scanning with mark spacing of 1/5". The dimensions **A** and **H** are decisive for the correct lateral setting of the OMR read head. When these dimensions, due to inaccurate printing or cutting of the documents, are smaller or larger (deviations max. -1 to +3 mm), compensation can be achieved by corresponding adjustment:



	min.	norm.	max.
A		**13.97**	
B		5.08	
C	10		
D	1		4
E	1.5		
F		3.0	
G	10		
H		**7.62**	
I		5.08	

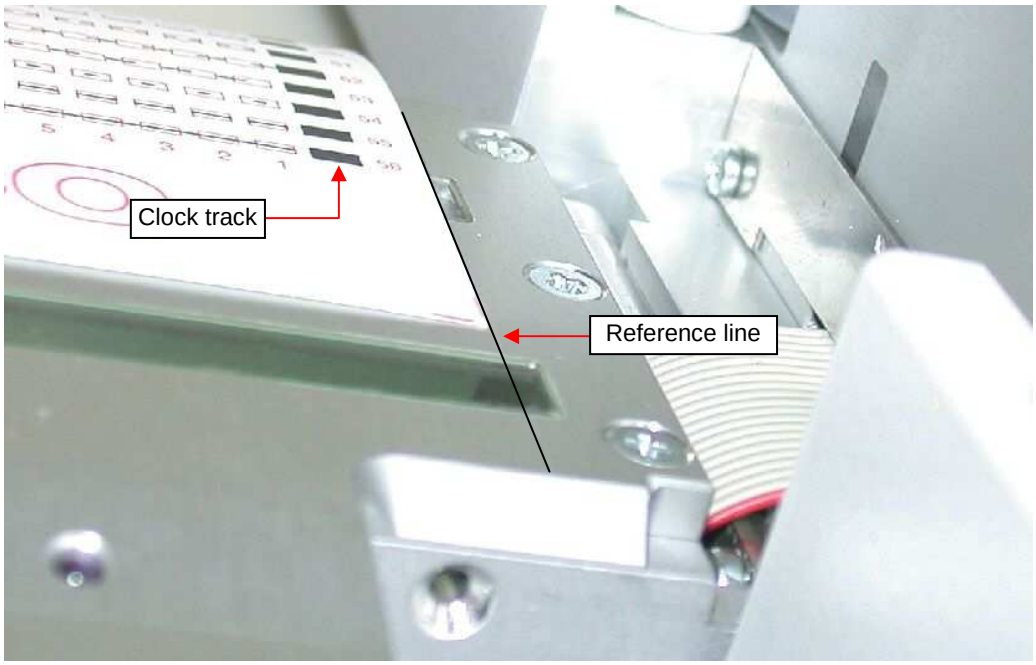
The read head must be adjusted when marks (even quite solid marks) that do not fill out the entire width of the mark field, are not scanned at all or are only

scanned in an inaccurate manner. It is also typical that marks are recognized although they are actually too short or are situated clearly off-center in the mark field.

4.1.2 Adjusting the lateral setting of the OMR read head

- Open the scanner cover.
  On the front side of the scanner cover there is an opening for the setting screw of the scanning strip:

The position at which the document stopper is located during the read process is designated by a reference line on the base plate of the read head:



- Insert the hexagon socket screw key into the opening and turn it
  - clockwise: the scanning strip is set further away from the edge of the document (edge with the clock mark), that is, away from the reference line.
  - counter-clockwise: the scanning strip is set closer to the edge of the document (edge with the clock mark), that is, closer to the reference line.

  With one rotation of the hexagon socket screw key the scanning strip is shifted by 0.5 mm in the respective rotational direction. Additional information about adjusting the scanning strip is to be found in section 4.1.4 “Effect of the read head setting on the scanning result”.
- Subsequently conduct a test run with original documents to check the setting of the read head.

4.1.3 Adjusting the lateral setting of the lower OMR read head (option)

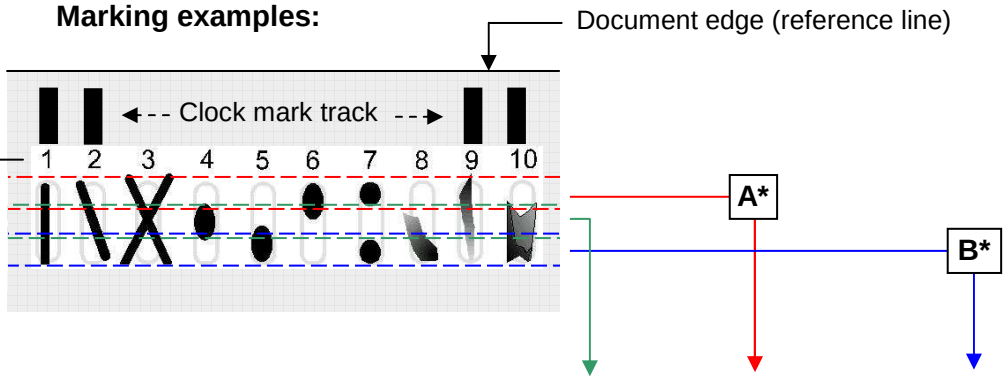
- Open the scanner cover.
  At the front of the lower scanner cover there is also an opening for the setting screw for the adjustment of the scanning strip:
- Insert the hexagon socket screw key into the opening and turn it
  - clockwise: the scanning strip is set further away from the edge of the document (edge with the clock mark), that is, away from the reference line.
  - counter-clockwise: the scanning strip is set closer to the edge of the document (edge with the clock mark), that is, closer to the reference line.

  With one rotation of the hexagon socket screw key the scanning strip is shifted by 0.5 mm in the respective rotational direction. Additional information about adjusting the scanning strip is to be found in section 4.1.4 “Effect of the read head setting on the scanning result”.
- Subsequently conduct a test run with original documents to check the setting of the read head.

4.1.4 Effect of the read head setting on the scanning result

On the basis of examples of various mark types and mark positions the following table shows how the scanning result is dependent upon the lateral setting of the read head. The test points (examples 4, 5, 6, 7) are also to be found on the DATAWIN test document, with the aid of which you can quickly obtain information about the setting of the read head and accordingly correct the setting of the scanning strip.

Marking examples:



	Comments on the marking	Scanning strip is set correctly.	Interval from scanning strip to reference line too slight for document.	Interval from scanning strip to reference line too large for document.
		Scanning		
1	Correct	Accurate	Accurate	Accurate
2	Correct	Accurate	Accurate	Accurate
3	Correct	Accurate	No	No
4	Test point: middle	Accurate	No	No
5	Test point: lower edge	No	No	Yes
6	Test point: upper edge	No	Yes	No
7	Test point: upper & lower edges	No	Yes	Yes
8	Sloppy, bleeding mark	Inaccurate	No	Inaccurate
9	Bleeding mark	Inaccurate	Accurate	Inaccurate
10	Short, bleeding mark (as with an old ball point pen)	Inaccurate	No	Accurate

*)

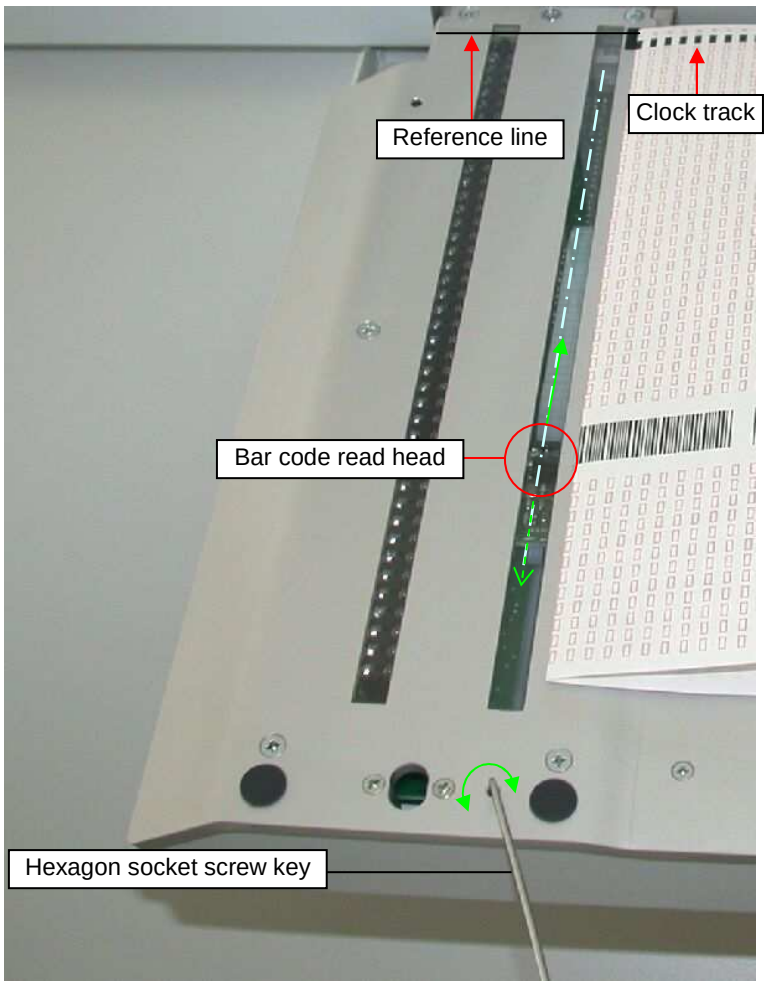
A
If the interval from the scanning strip to the reference line is too slight, **enlarge** the size of the interval by turning the hexagon socket screw key **clockwise**.

B
If the interval from the scanning strip to the reference line is too large, **reduce** the size of the interval by turning the hexagon socket screw key **counter-clockwise**.

4.2 Setting the bar code read head (option)

To achieve proper recognition of the bar code, the bar code read head must be positioned over the area to be read – as far as possible in the middle – while the document is being transported. You can easily check the setting of the bar code read head and, if necessary, correct it:

- Open the scanner cover.
- Place one of the bar code documents to be processed on the scanning unit in such a manner that the edge on which the clock track is located lies flush along the reference line of the base plate. (This reference line identifies the position at which the document stopper is located during the read process).



There is an opening located next to the window of the bar code read head; the adjusting screw for the read head is behind this opening:

- Insert the hexagon socket screw key into the bore hole and by turning the key, position the bar code read head above the middle of the bar code that is printed or glued onto the document.

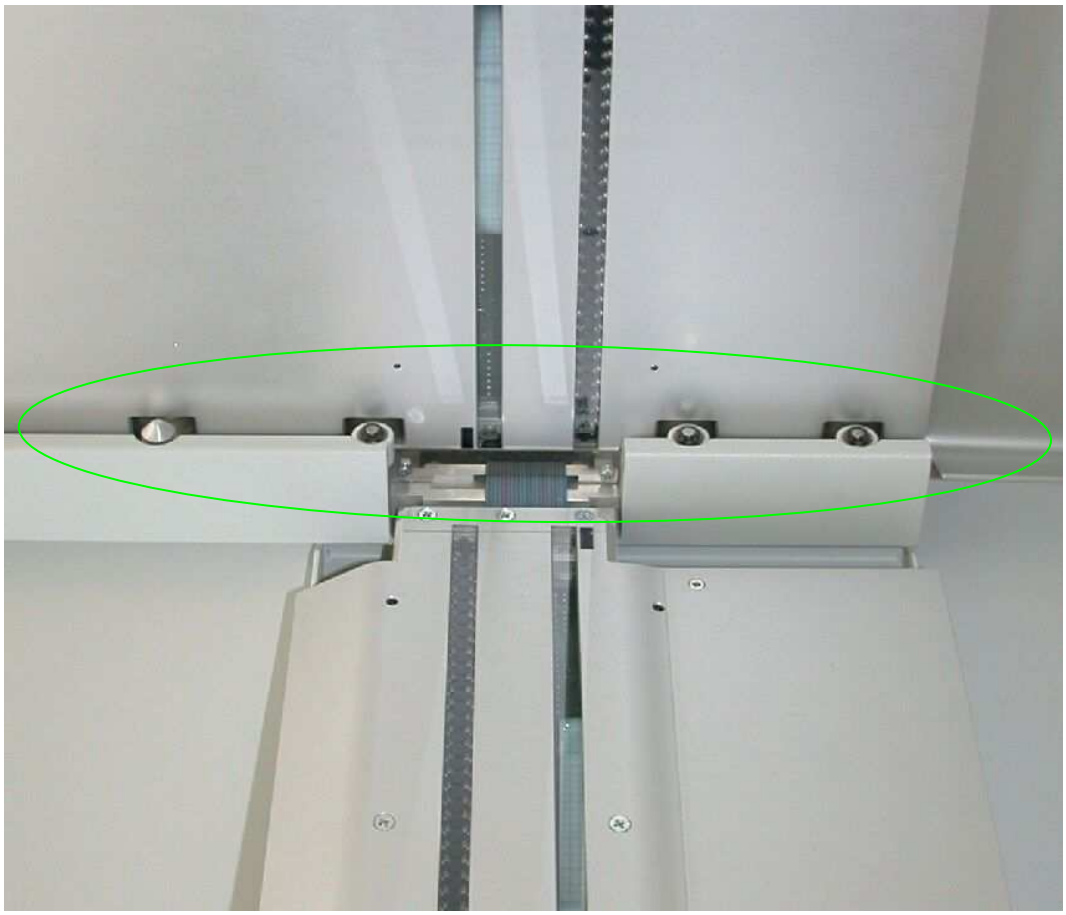
4.3 Cleaning the document transport path

The axm935 is insensitive to a great degree to the usual "office dust". Only in the case of very soiled documents or documents that have a rough surface may it be necessary during the course of longer operation to clean the paper path.

Tools: cleaning brush, spirits of wine, cleaning cloth

! When you are working with spirits of wine, be sure that there are no burning objects (cigarettes or similar) in the environment of the working place.

- Turn off the reader and open the scanner cover.



- Blow forcefully with a breath of air to clean the transport path.
  If necessary use the brush to loosen any stubborn, adhering dirt.
- Clean the protective glass surfaces of the read stations using a lint-free cleaning cloth. If required, saturate it lightly beforehand with spirits of wine.
- Also clean the transport rollers with a cloth lightly saturated with spirits of wine.

4.4 Trouble shooting

The following table shows problems that may arise and measures that you can take to eliminate the errors.

Problem	Measure
Read errors	
Recognition of the marks is becoming increasingly poorer.	♦ Check if the scanner is dirty. If necessary, clean the covers (protective glass covers) of the read heads (see section 4.3). ♦ Check if the lateral setting of the scanner is correct or if it possibly should be adjusted (see section 4.1).
Marks are not recognized, especially at the beginning and/or end of the document.	♦ Check if the edges of the documents are straight. ♦ Check if the transport rollers are dirty (see section 4.3).
Marks are recognized at places where there are no marks, especially at the beginning and/or end of the document.	♦ Check if the edges of the documents are straight. ♦ Check if the transport rollers are dirty (see section 4.3).
Document transport	
The document placed on the intake guide is not drawn in.	♦ Check whether the application software is running. Is the feed-in command from the PC missing or was the data of a document previously read not called? ♦ Turn the reader off and after about 3 sec. turn it on again. Start the PC again according to the software description.
A document was rejected as "poor"; another attempt is to be made to read the document.	♦ Lift the document briefly out of the intake guide and then replace it again.
The document is drawn in but is not scanned completely. The ejection behavior is not defined.	♦ Check if the transport rollers are dirty (see section 4.3). ♦ Contact your supplier if you are using documents that have clock marks that are wider than those prescribed and that thus do not correspond to the document specification.
Document output	
The document is drawn in correctly, the read data is transmitted to the PC, but the reader does not output the document.	Try the measures described above and if necessary: ♦ Clean all the light barriers in the transport path (see section 4.3). ♦ Check if the interface cable is firmly connected. If these measures still do not remedy the situation please contact Axiome's support: Hotline: +41 32 732 18 18 Fax: +41 32 732 18 00 E-Mail: support@axiome.ch

5 Test Program "OMR-Test"

This chapter describes the method of operation, the structure and the functions of the test program "OMR-Test" for the axm935 reader. The description presupposes that the user has knowledge of the Windows environment along with its control menus and commands via mouse and keyboard.

The test program "OMR-Test" enables you to check functions and settings of the reader, whereby parameters can be read out of the flash ROM of the reader control system and stored there again. The program is installed on the PC (starting from Windows98).

Installing the program

To install the program you must be logged on as administrator.

- Terminate all applications running on the PC.
- Insert the program CD "OMR Reader Update-Tools" and click on "Start" > "Run".
  "Setup.exe" starts the usual Windows installation procedure.
  The directory "OMR-Tool" is stored under "C:\Program\".
- You can subsequently place the program icon of the test program on your desktop.
  Pull the file "OMR_Tool.exe" from the directory "OMR-Tool" onto your desktop.

  You can then rename the icon, e. g. "OMR-Test".

Starting the program

- Click on "Start" > "Program" > "OMR-Tool" > "OMR-Tool"

  or

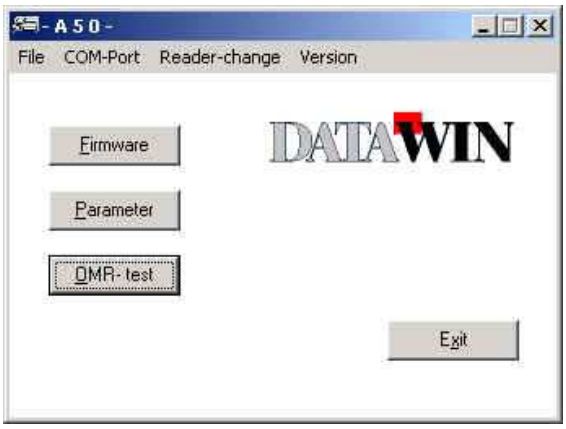
- double click on the program icon on your desktop:

The main window will be opened (see section 5.1).

5.1 Main window

The test program has a user surface that is typical of Windows. All the functions can be activated directly via switching buttons from the main window.

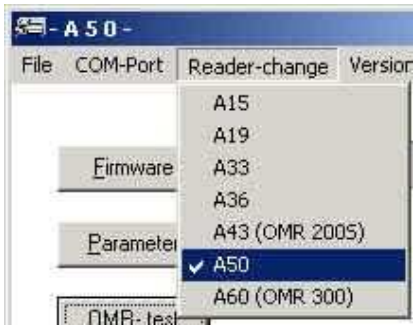
Menus can be opened in the menu bar and their commands can be started or activated by the mouse.



5.1.1 Functions in the menu bar

- **File**
  "Exit" terminates the program.
- **COM-Port**

  Sets the interface via which the reader is connected to the PC.
- **Reader-change**



  Displays the possible types of readers. The reader that is connected – in this case the "A50 (axm935)" – is displayed.

- **Version**

  Shows the version number of the test program.

  – "Help" informs you of the functions in the function bar.

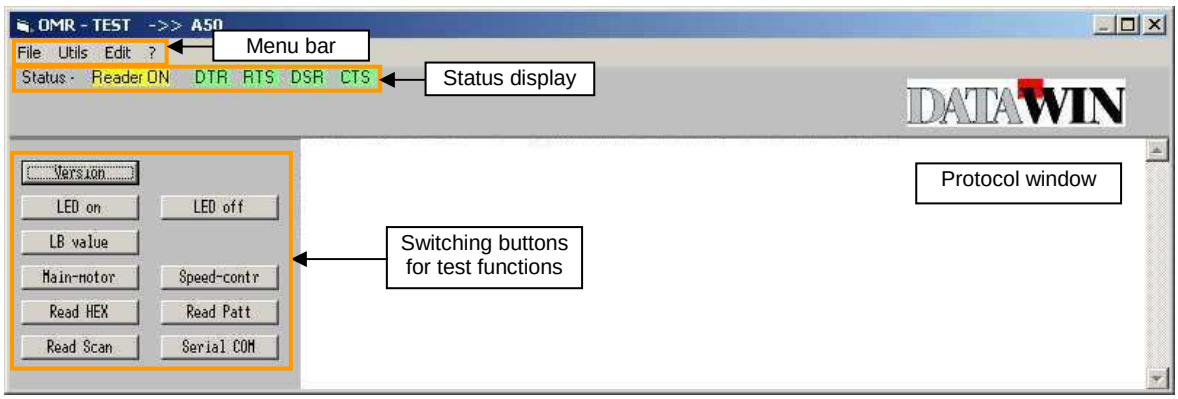
5.1.2 Functions of the switching buttons

- **Firmware**
  Loads a new or specific firmware version from the PC into the flash ROM of the axm935.
- **Parameter**
  Loads parameters e. g. after a change of the firmware version from the PC into the flash ROM of the axm935.

  The reader must be turned off before you start these load functions; after starting the program, it prompts you to turn the reader on again.
- **OMR-test**
  This button starts the test program with the window "OMR-Test".
- **Exit**
  Terminates the test program.

5.2 "OMR - Test" window

The operation of the test program is clear and simple, because in the OMR-Test window all the functions can be activated directly via switching buttons. The parameters that are read out are thereby output in a protocol window.

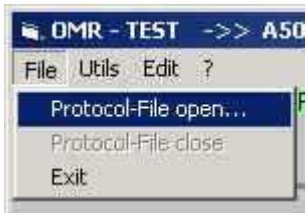


Menus can be opened in the menu bar and their commands can be started or activated by the mouse.

5.2.1 Functions in the menu bar

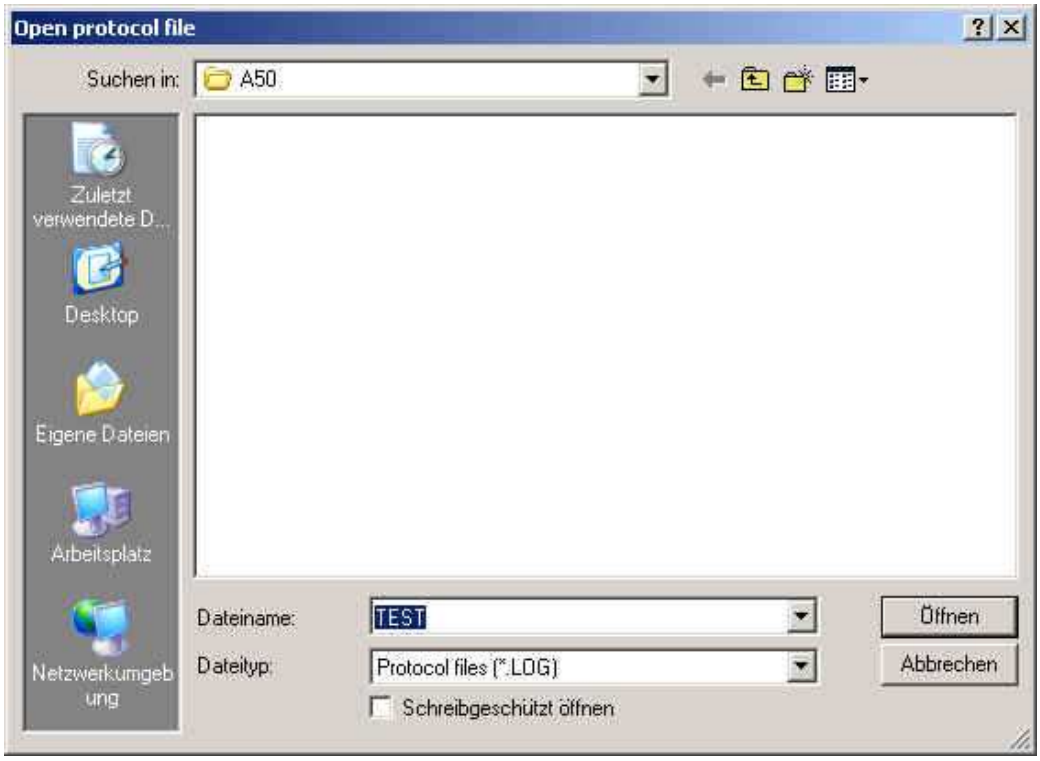
- **File**

– "Protocol-File open..."



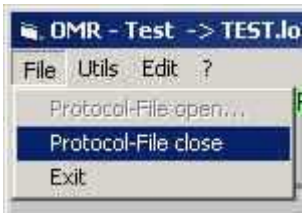
Opens a window for the selection of a particular protocol file.

All the data sent from the reader is stored in the protocol files.



Protocol files have the extension ".log".

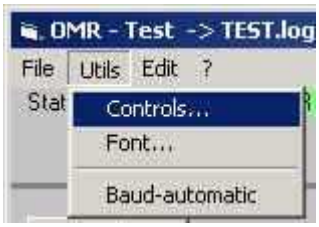
– "Protocol-File close"



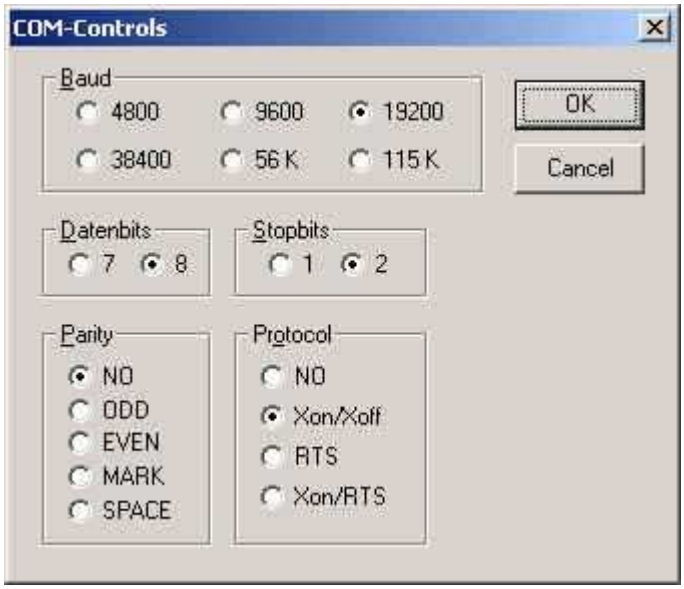
Closes the protocol file

– "Exit"
Terminates the program

- **Utils**

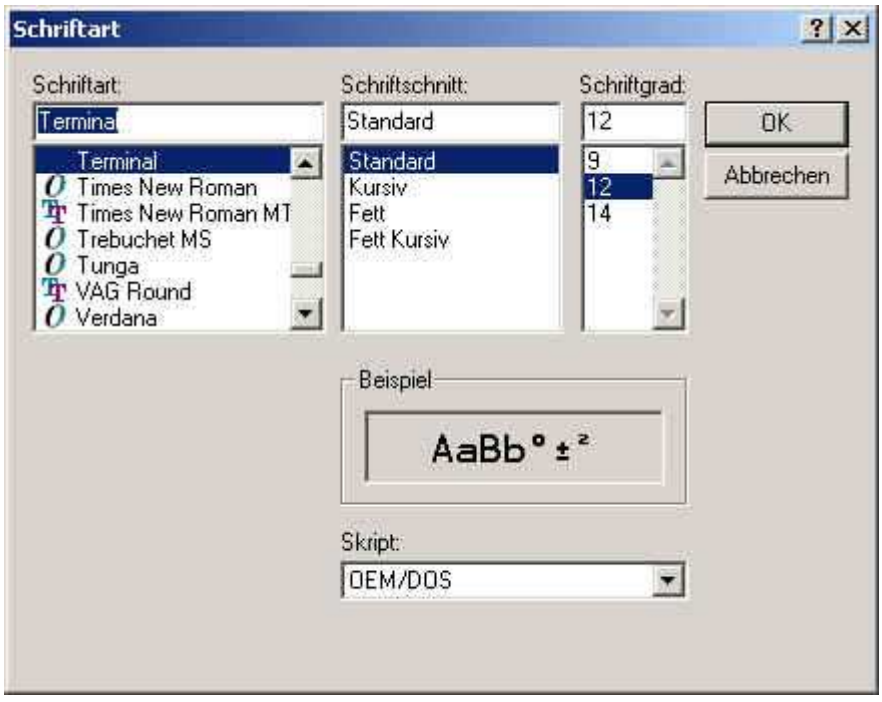


– "Controls"



Sets baud rate, data bits, stop bits, parity and protocol.

– "Font"



Changes the character font and type size for the display in the protocol window.

– "Baud-automatic"
When the reader is turned on, its baud rate is automatically set to the baud rate of the PC.

- **Edit**

  – "Copy"
  Copies the text marked in the protocol window into the intermediate storage of the PC. You can then transfer the contents into an opened text file (.txt).

  – "Clear all"
  Deletes the contents of the protocol window.

- **?**
  Shows help texts for the functions of the OMR-Tool.

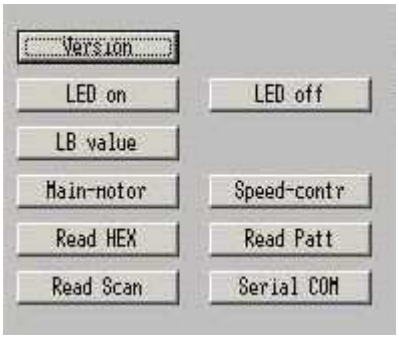
5.2.2 Status display

In the status display you can see if the connected reader is turned on and if the interface is active.

5.2.3 Functions of the switching buttons

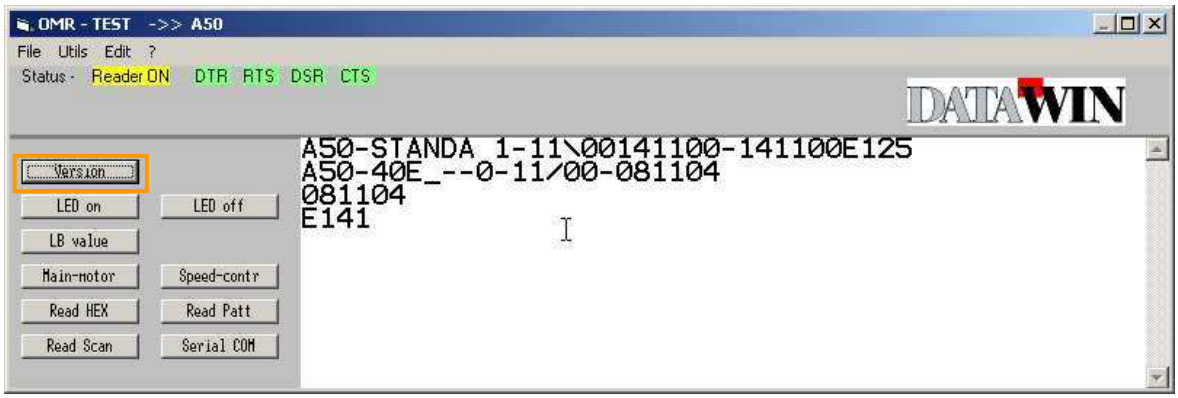
Depending on the respective function of the switching button, the parameters that are read out are displayed in a protocol window.

You can store the contents of the protocol window in a protocol file (.log), which you can then e. g. send by email as information and for clarification to the technician of your axm935 supplier.

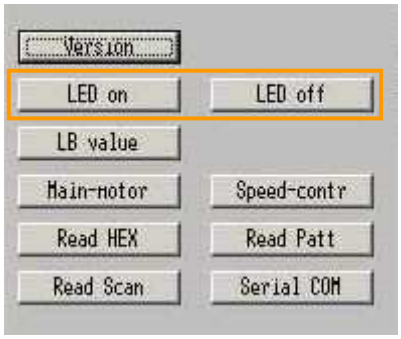


5.2.3.1 Reading out the firmware version

Clicking on the switching button "Version" causes the firmware version to be displayed in the protocol window, e. g.:



5.2.3.2 Checking the OMR read head lighting



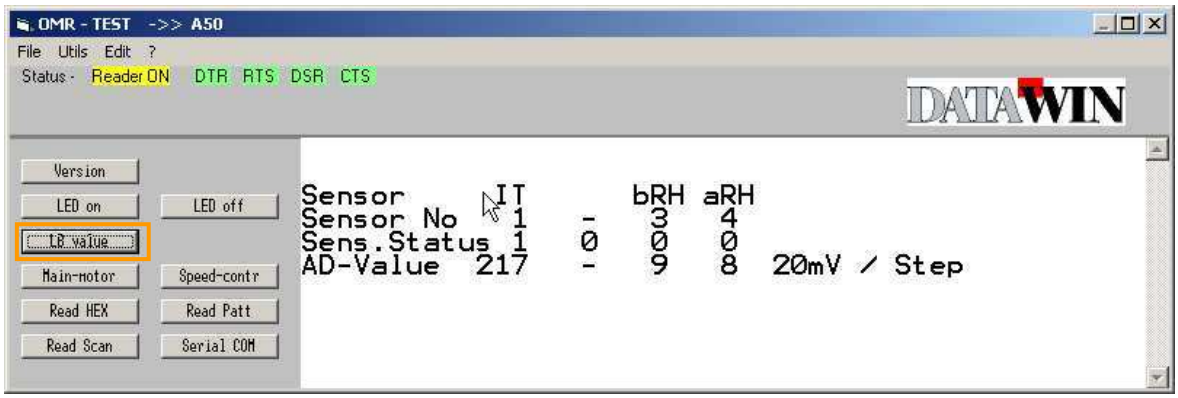
- Open the scanner cover of the reader.
- Click on "LED on" to turn on the lighting of the OMR read head(s).
- Check whether all the LEDs are lit.
  If this is not the case, notify your supplier.
- To turn the lighting off, click on "LED off".

This check is only possible for standard scanning with red light.

5.2.3.3 Checking the values of the light barriers

You can cause the values of the light barriers in the transport path of the axm935 to be displayed (also see section 6.5.2 on this).

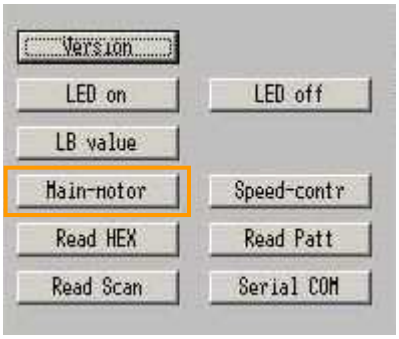
- Click on "LB value".
  The parameters will be displayed in the protocol window, e. g.:



Whereby the following apply: **IT** = Input Tray (potentiometer 1); **bRH** = before Read Head (potentiometer 3); **aRH** = after Read Head (potentiometer 4).

5.2.3.4 Testing the motor

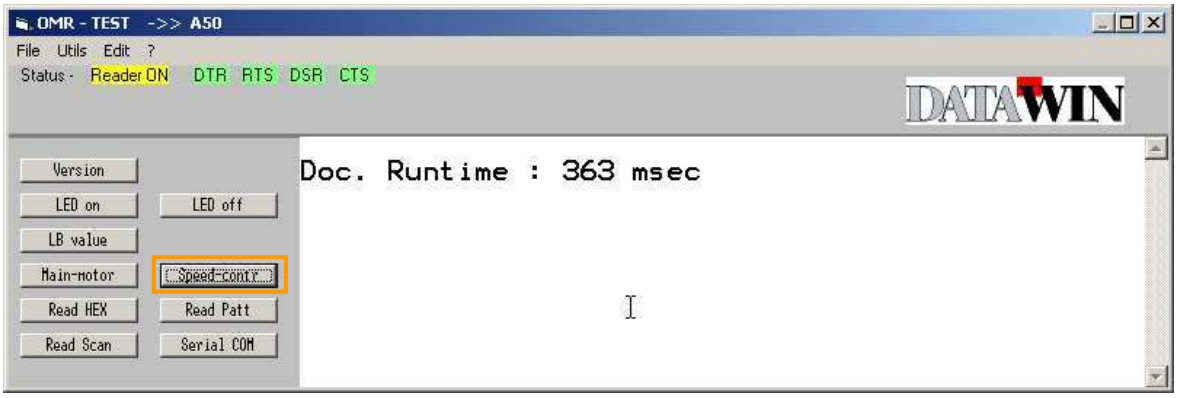
You can test the motor of the reader directly by means of a switching button from the PC:



- Click on the switching button "Main-motor" to start the motor.
- To stop the motor, click again on this switching button.

5.2.3.5 Checking the speed

- To cause the display of the transport speed that is currently set, click on the switching button “Speed-contr”.



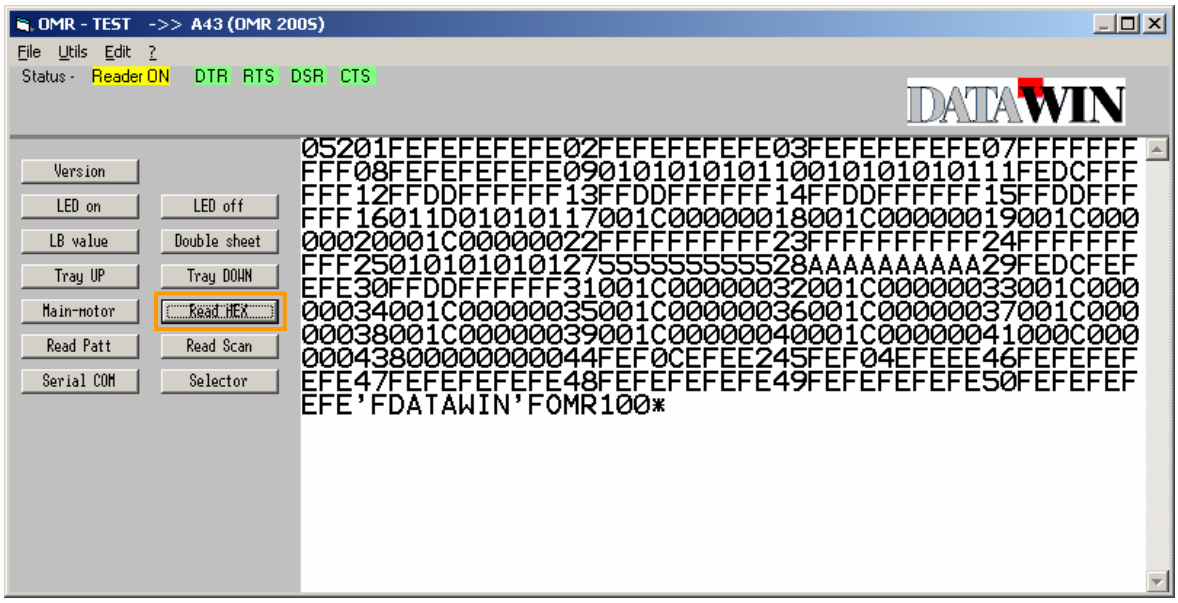
5.2.3.6 Read tests

In case of problems you can test a document by means of three different read functions:

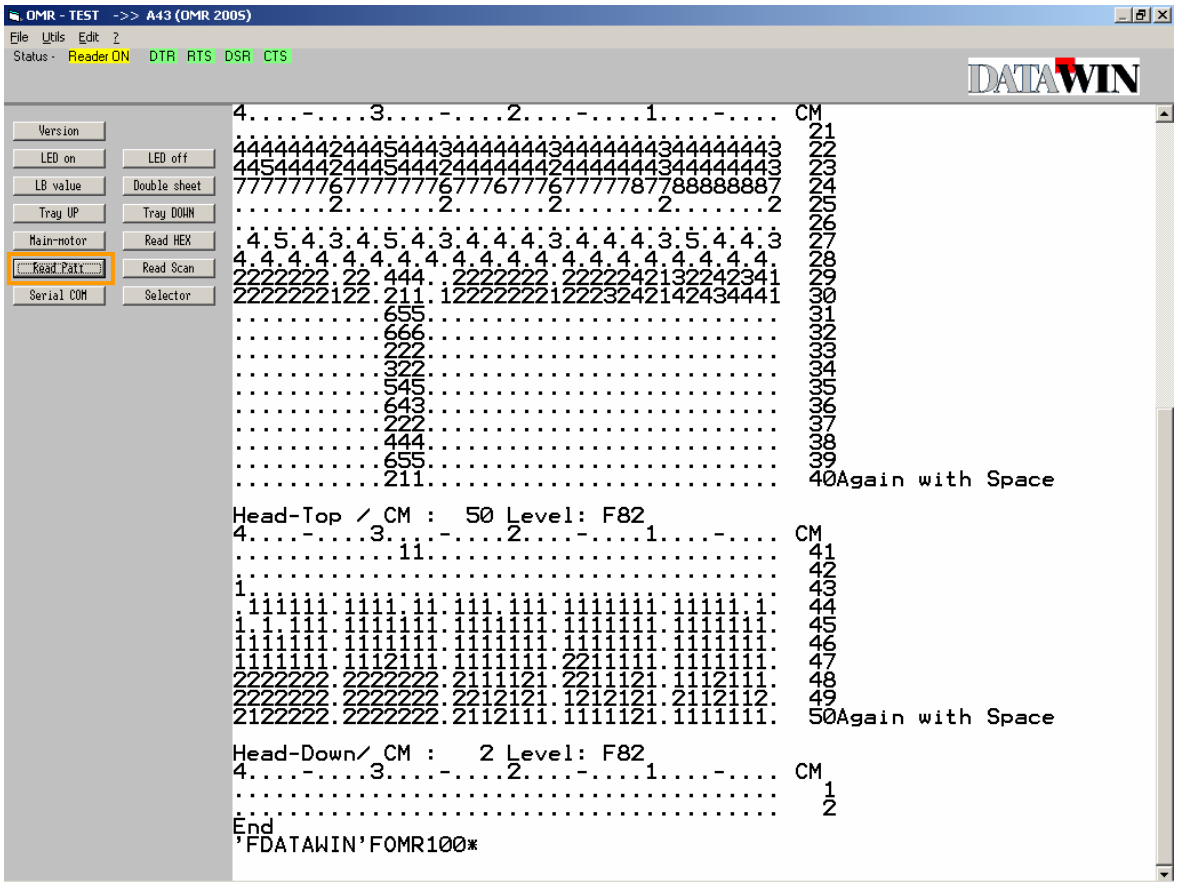
- Switching button **"Read HEX"** (hexadecimal)
  Output of the document data in the form in which the reader transfers the data to the PC and to the read program.
- Switching button **"Read Patt"** (mark pattern)
  Visualization of all the marks of the document that is read.
- Switching button **"Read Scan"** (repeated reading at short time intervals)
  Checking of the position of the document in the transport path, in order e. g. to detect documents that are printed or cut askew.

The read results will be displayed in the protocol window and can subsequently be copied into a text file (see section 5.2.1).

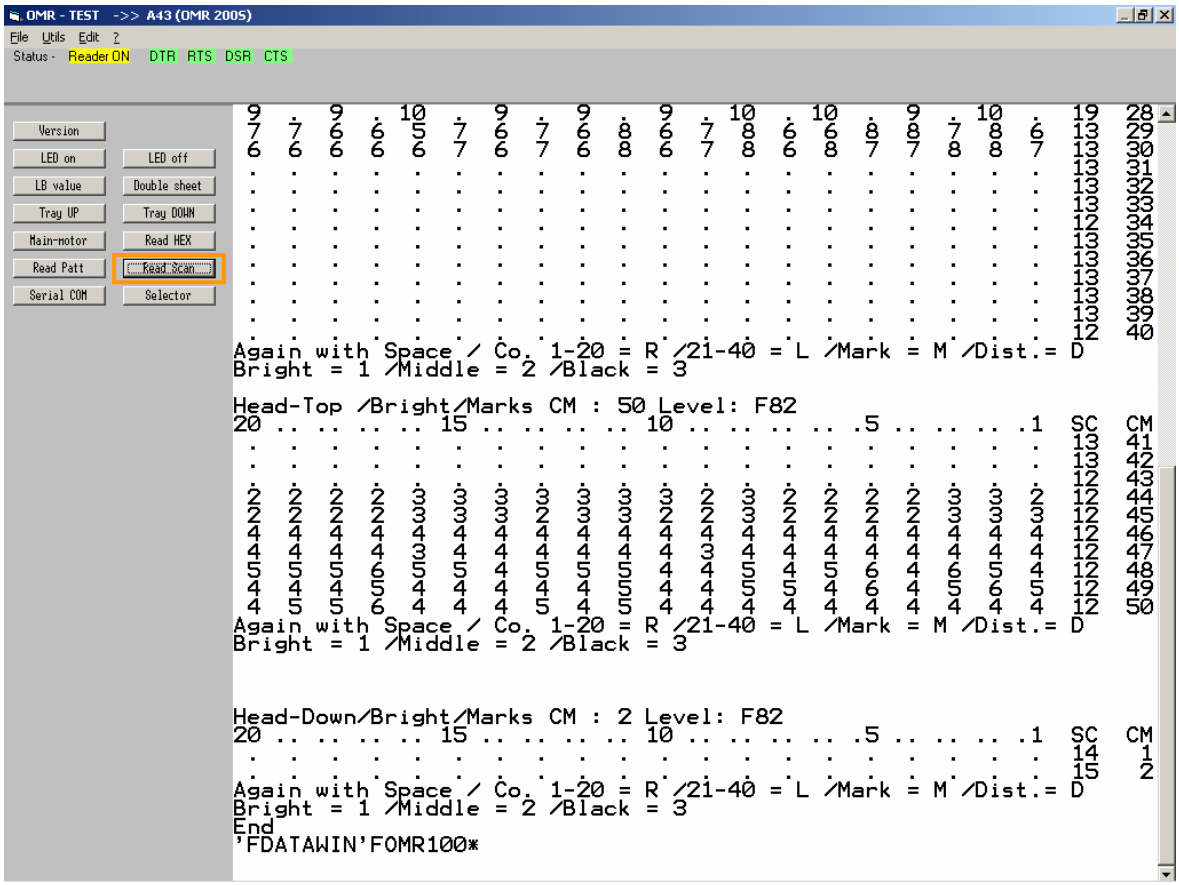
Example of hexadecimal output:



Example of pattern output:

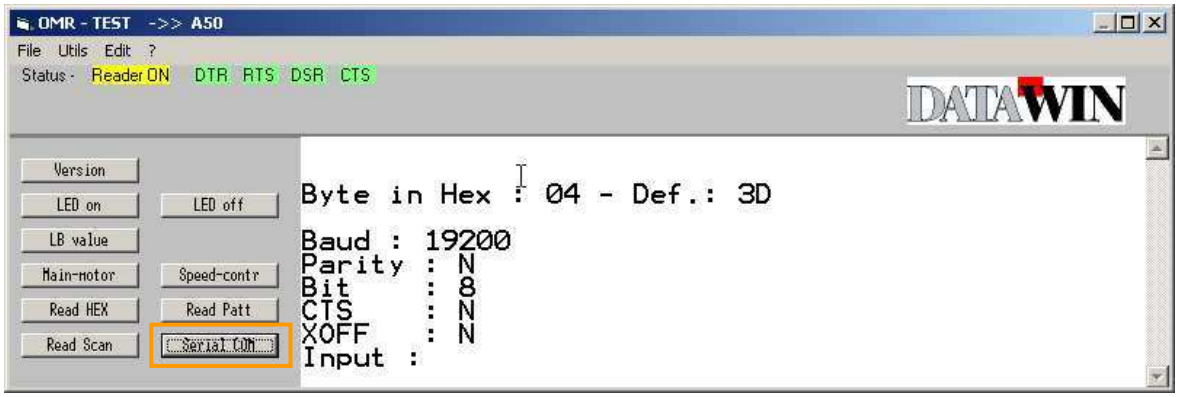


Example of scan output:


OMR - TEST ->> A43 (OMR 2005)
File Utils Edit ?
Status - Reader ON DTR RTS DSR CTS
Version
LED on
LED off
LB value
Double sheet
Tray UP
Tray DOWN
Main-motor
Read HEX
Read Patt
Read Scan
Serial COM
Selector
Again with Space / Co. 1-20 = R /21-40 = L /Mark = M /Dist.= D
Bright = 1 /Middle = 2 /Black = 3
Head-Top /Bright/Marks CM : 50 Level: F82
Again with Space / Co. 1-20 = R /21-40 = L /Mark = M /Dist.= D
Bright = 1 /Middle = 2 /Black = 3
Head-Down/Bright/Marks CM : 2 Level: F82
Again with Space / Co. 1-20 = R /21-40 = L /Mark = M /Dist.= D
Bright = 1 /Middle = 2 /Black = 3
End
'FDATAWIN'FOMR100*

5.2.3.7 Output of the parameters of the serial interface

- Click on the switching button "Serial COM".
  The currently valid interface parameters will be output, e. g.:



6 Carrying out repairs

This chapter describes which wearing parts and spare parts of the axm935 you can replace by yourself. The operations are arranged and structured according to the functional groups and components of the reader.

- Remove the parts of the housing
- Repair work on the
  - document intake
  - document transport
  - document output
  - OMR scanner
  - bar code reader
  - electrical parts / electronics

Always interrupt the current supply before removing the rear panel of the housing!
Unplug the mains plug before you begin work on the opened reader. All repair operations may be carried out in an idle state only.

6.1 Disassembling the reader housing parts

In order to replace certain system components and wear and spare parts of the reader, you must possibly – depending upon the location of the mounting space and of the electrical connection – remove different housing parts beforehand.

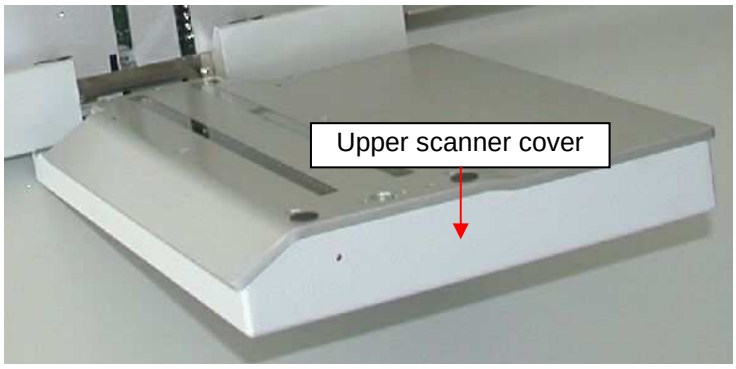
Tools: cross-tip screwdriver (size 1)

Reader housing part "rear panel"

! Before you remove the housing rear panel you must turn off the reader and disconnect the mains plug!

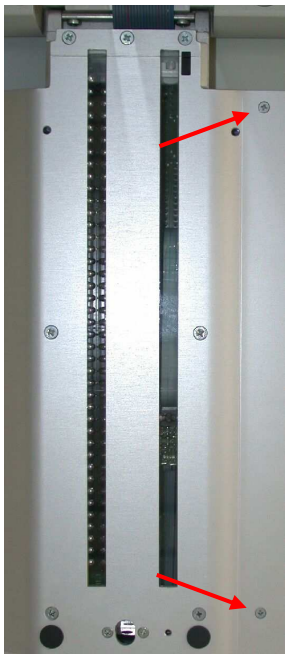
♦ Remove the six countersunk head screws and lift off the rear panel.

Reader housing part "upper scanner cover"

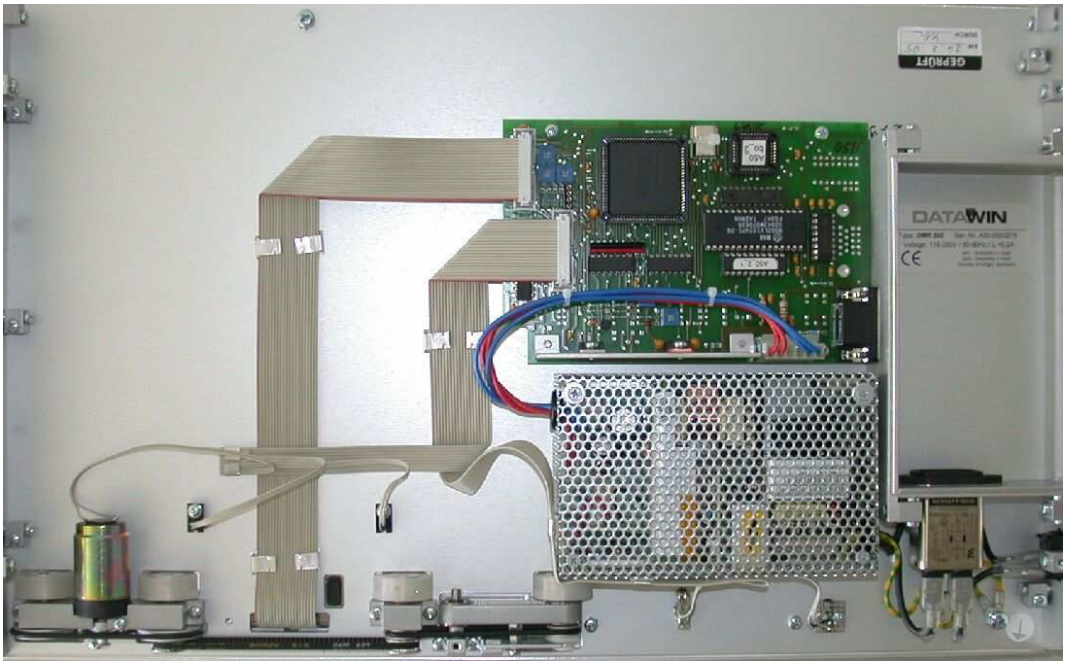


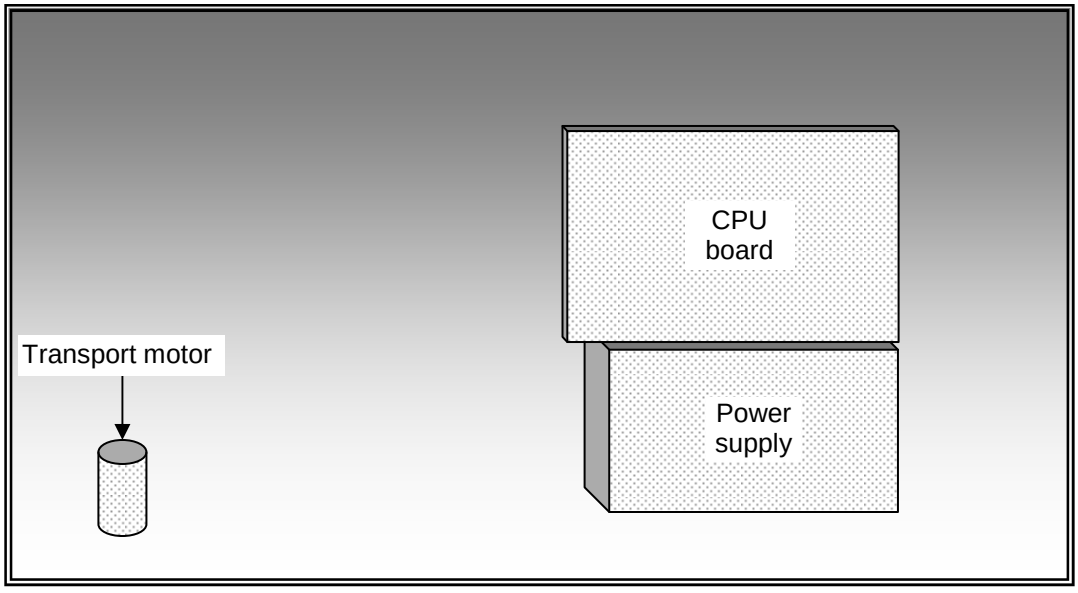
You must remove this part in order e. g. to replace the OMR read head.

♦ Remove the two countersunk head screws on the bottom side of the read head plate and lift off the scanner cover.



Disassembling components inside the housing



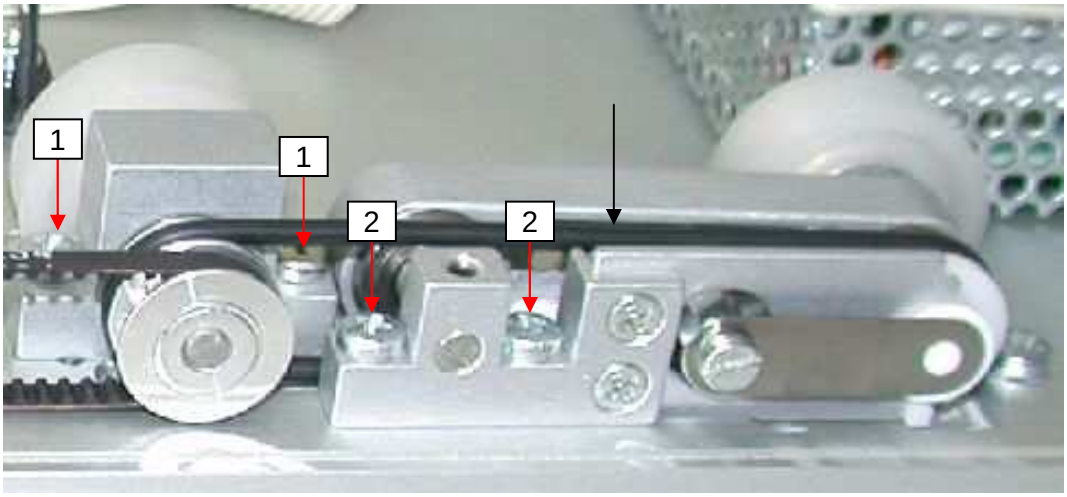


In order to access certain installed parts and connections inside the housing, it may be necessary that you disassemble one or more of these components. The respective assembly and disassembly operations are described in detail in the following sections:

- Belts and transport rollers (section 6.2)
- Light barriers/cable harness (section 6.3)
- Transport motor (section 6.4)
- CPU board (section 6.5)
- Power supply (section 6.6)

6.2 Working on the driving mechanism

6.2.1 Replacing the driving belt for the feed roller (swivel roller)



Tools: cross-tip screwdriver (size 1)

Spare parts: 1 round belt ATX 40 x 2.6

How to insert the new round belt:

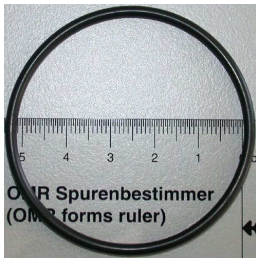
- Remove the rear panel of the housing (see section 6.1).
- Remove the torn belt from the housing.
- Unscrew the bearing block (1) and unscrew the bearing block of the feed roller (2).
- Place the new belt around the respective roller pair and then screw tight the bearing blocks.

! Round belts are rather sensitive to cuts or nicks on the surface. Therefore, take care to assure that the surface of the newly inserted belts is not damaged. The belt would otherwise tear within a very short time.

- Remount the rear panel of the housing.

6.2.2 Replacing the round belt of the drive motor

Tools: cross-tip screwdriver (size 1)

Spare parts: 

round belt ATX 52 x 2,6

How to insert the new round belt:

- Remove the rear panel of the housing (see section 6.1).
- Remove the torn belt from the housing.
- Unscrew the motor block with the drive rollers.
- Place the new belt around the respective roller pair and then refasten the motor block with the screws again.

! Round belts are rather sensitive to cuts or nicks on the surface. Therefore, take care to assure that the surface of the newly inserted belts is not damaged. The belt would otherwise tear within a very short time.

- Remount the rear panel of the housing.

6.2.3 Replacing the toothed belt

Tools: cross-tip screwdriver (size 1)

Spare parts: toothed belt S2M-234

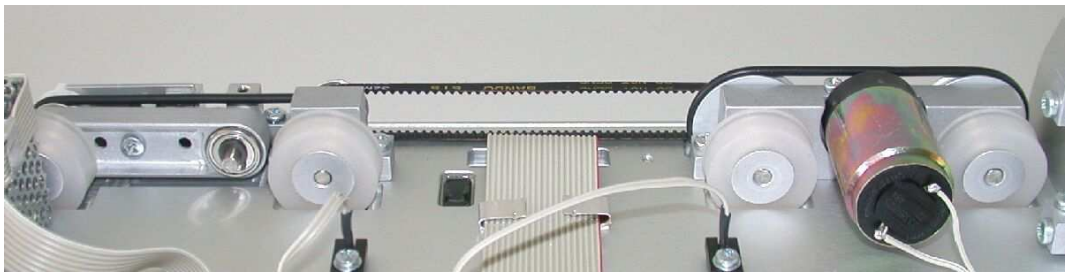
How to replace the toothed belt:

- Remove the rear panel of the housing (see section 6.1).
- Remove the torn belt from the housing.
- Unscrew the bearing block (see section 6.2.1) and the motor block with the drive rollers (see section 6.2.2).
- Insert the new toothed belt and tighten again the motor block and bearing block with the screws.

! The toothed belt may not be bent or buckled!

- Remount the rear panel of the housing.

6.2.4 Replacing the silicone rings of the transport rollers



Tools: cross-tip screwdriver (size 1)

Spare parts:

silicone rings 24 mm with lip and recess on the side (groove)

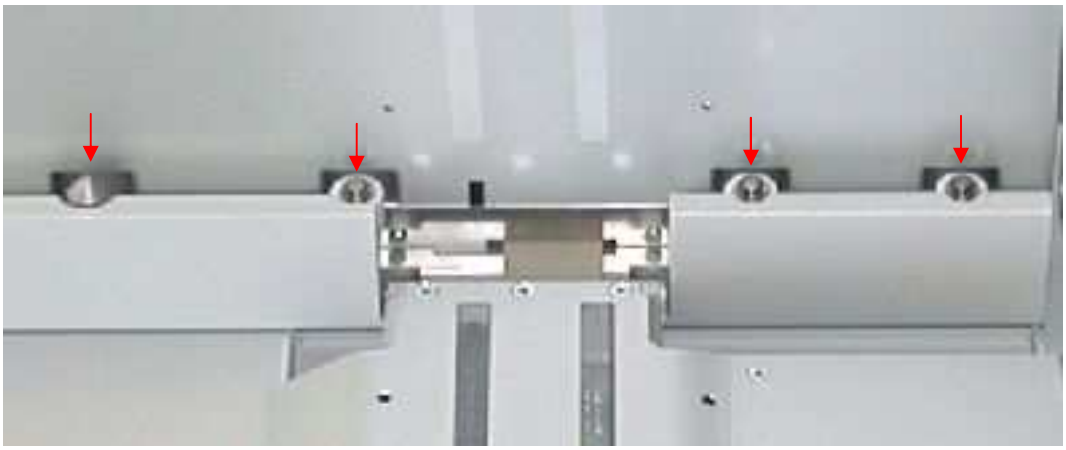
How to replace the rings of the transport rollers:

- Remove the rear panel of the housing (see section 6.1).
- Unscrew the respective bearing block.
- Pull off towards the front the ring that is to be replaced from the transport rollers and replace it by a new ring.

! Take care to assure that the side of the ring on which the groove is located is pointed towards the document guide (towards the bearing block).

- Retighten with the screws the bearing block that you removed.
- Check whether the ring rotates properly.
- Remount the rear panel of the housing.

6.2.5 Replacing the counter-pressure rollers



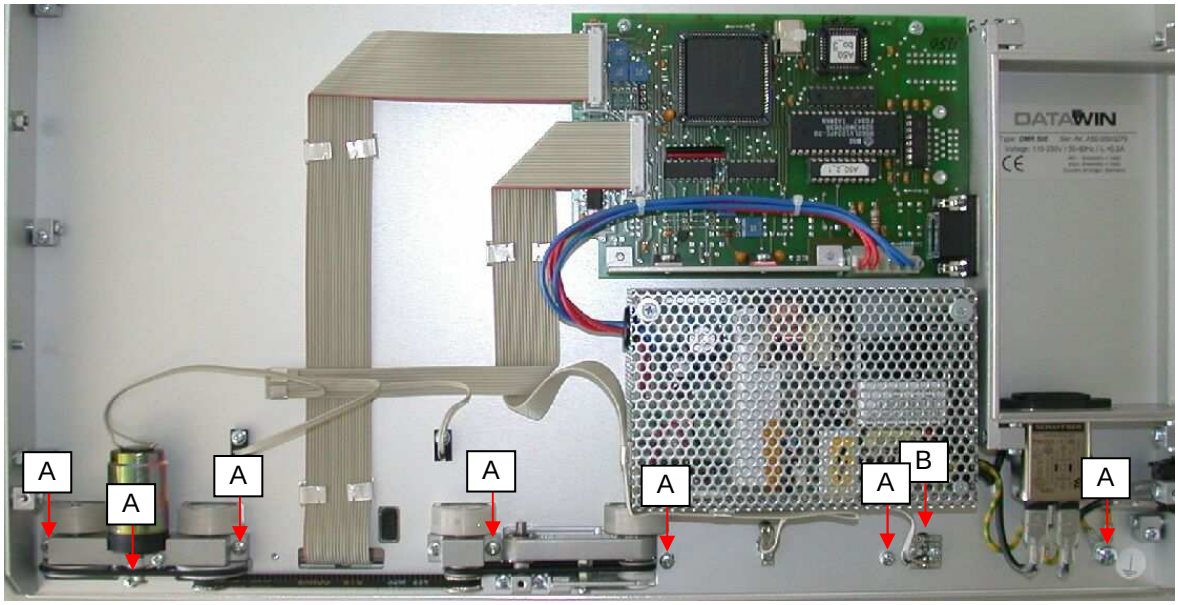
Tools:
– cross-tip screwdriver (size 1)
– hexagon socket screw key 1.5 mm

Spare parts:

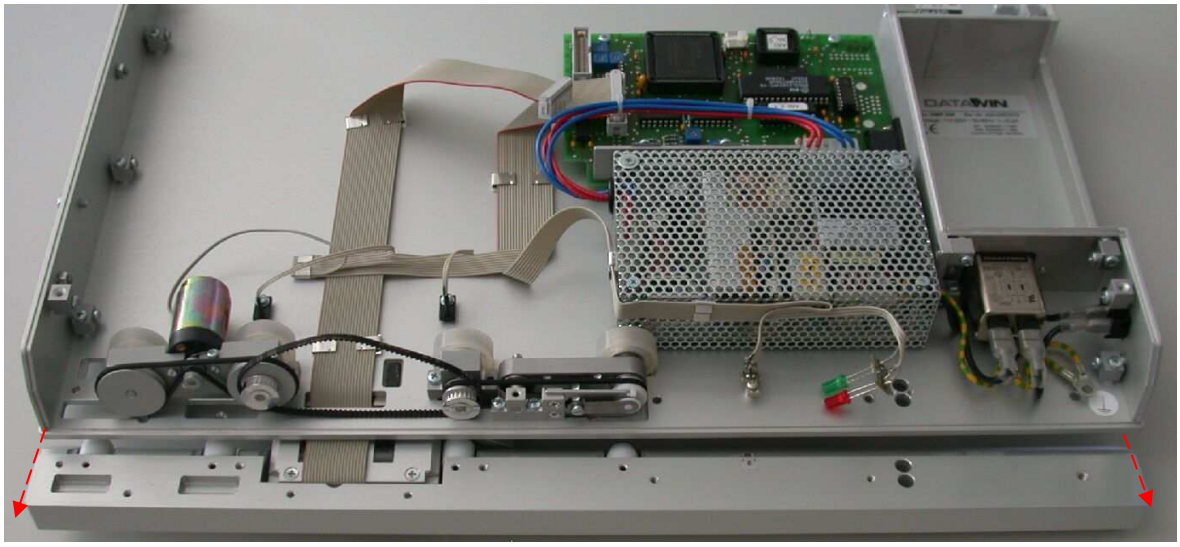
– counter-pressure roller 18 mm
– counter-pressure roller for feeding in, conical, 18 mm

How to replace defective counter-pressure rollers:

- Remove the rear panel of the housing (see section 6.1).
- Unscrew the document guide strip (7 screws (A), see the figure).



- Unscrew the small holding board (B) for the two operating display LEDs and pull the LEDs out of the bore hole.
- Disconnect the flat ribbon connector for the read head from the CPU.



- Carefully pull out the guide strip with the read head towards the front (see the figure); you must lightly push the flat ribbon cable as well.

! Be careful to assure that you do not lose the prism of the light barrier and the small covering plate.

- Unscrew the axle of the defective counter-pressure roller with the hexagon socket screw key and pull out the axle.

! Take care in handling the distance disk.

- Pull off the defective roller and place the new roller onto the axle. (Don't forget the distance disk!)
- Insert the axle into the bore hole again and tighten it with the hexagon socket screw key.
- Re-assemble the reader in reverse order.

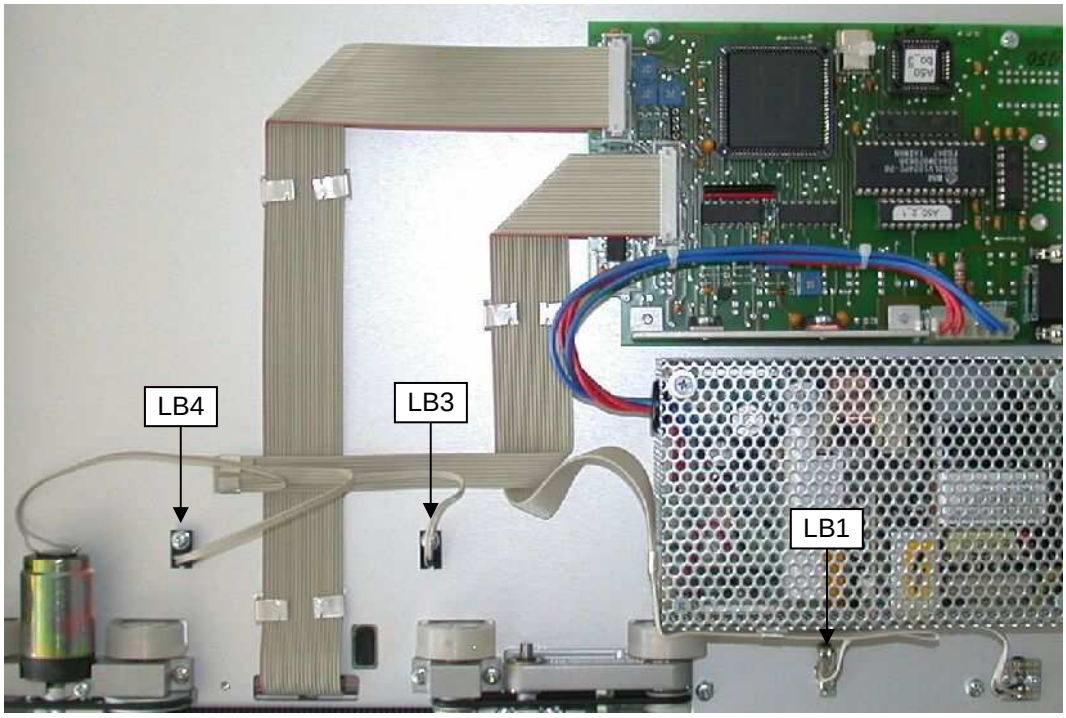
! Take care to assure that the prism of the light barrier and the small covering plate are positioned correctly again before you push the guide strip back again and fasten it.

- Remount the rear panel of the housing.

6.3 Replacing the cable harness

If your trouble shooting indicates that a light barrier is defective, replace the entire cable harness of the document reader with all its light barriers instead of only the one defective light barrier. The structural parts of the three light barriers are already partially soldered onto the cable harness:

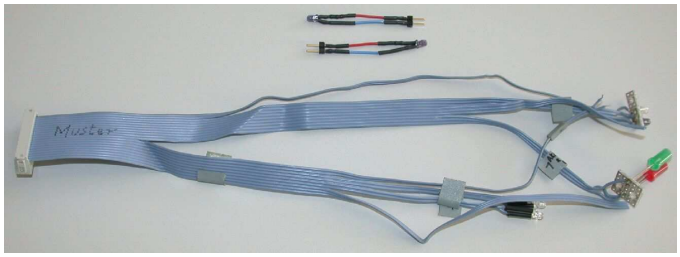
- **LB 1: "document presence in the intake tray"** (LED and photo transistor)
- **LB 3: "document presence before the scanner"** (photo transistor)
- **LB 4: "document presence after the scanner"** (photo transistor)



The LED connectors of LB 3 and LB 4 (in each case on the read head side) are plugged.

Tools: – cross-tip screwdriver (size 1)
– soldering iron

Spare parts:

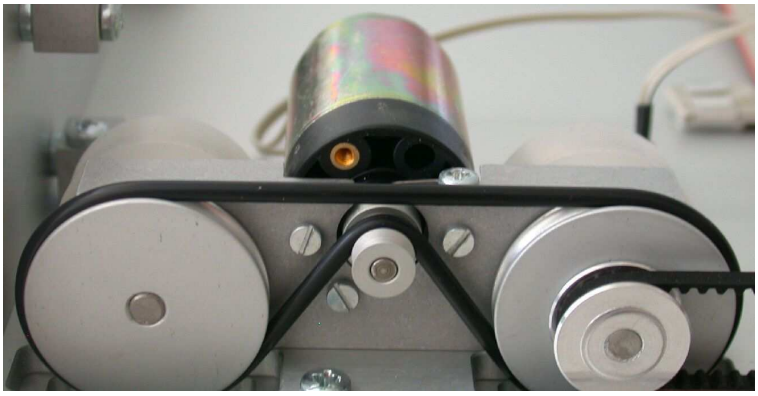


cable harness, 2 LEDs for LB 3 and LB 4

How to replace the cable harness:

- Remove the rear panel of the housing (see section 6.1).
- Unplug the cable harness plug from the CPU board.
- Unsolder the motor connections. Note the polarity.
- Unscrew the structural parts of the light barriers that are soldered onto the cable harness.
- Lift out the old cable harness, insert the new one and screw tight the structural parts of the light barriers that are soldered onto the cable harness.
- Solder again the connections for the motor and for the display of the operating status. Take care to observe the polarity.
- Connect the cable harness to the CPU board.
- Unscrew the scanner cover (see section 6.1).
- Remove the two LEDs next to the upper scanning strip and disconnect the connecting plugs.
- Connect the new LEDs and plug the connecting leads again (polarity: red/red - blue/blue).
- Check the signals of all the light barriers (in this regard, see sections 5.2.3.3 and 6.5.2).
- Remount the rear panel of the housing.

6.4 Replacing the motor



Tools:
– cross-tip screwdriver (size 1)
– hexagon socket screw key 1.5 mm
– soldering iron

Spare parts: direct-current motor 2338S 012S

How to replace the motor:

- Remove the rear panel of the housing (see section 6.1).
- Unsolder the motor connection. Note the polarity of the connection.
- Loosen the three screws at the front of the motor support and lift out the motor. Be careful of the round belt.
- Unscrew the pulley from the motor shaft and unscrew the motor support.
- Refasten the pulley and insert the new motor.

! Take care to assure that the contact spring for the derivation of the static charge rests lightly on the brass ring.

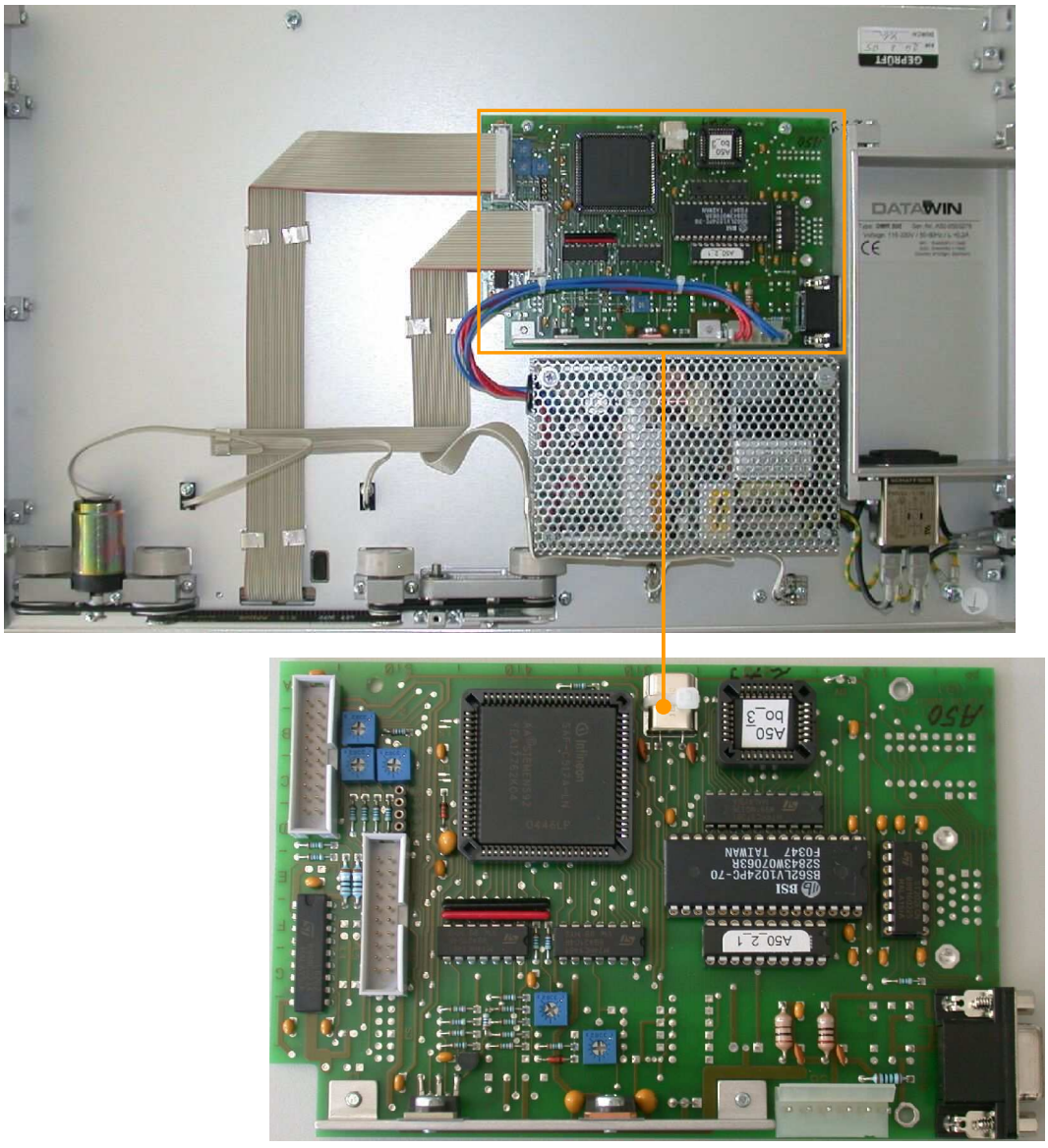
- Resolder the motor connection. Take care to observe the polarity of the connection.
- Reinsert the round belt.

! Note:
As a functional check you can start the motor by means of the test program (see section 5.2.3.4).

- Remount the rear panel of the housing.

6.5 Working on the CPU board

6.5.1 Disassembling and assembling the CPU board



Tools: cross-tip screwdriver (size 1)

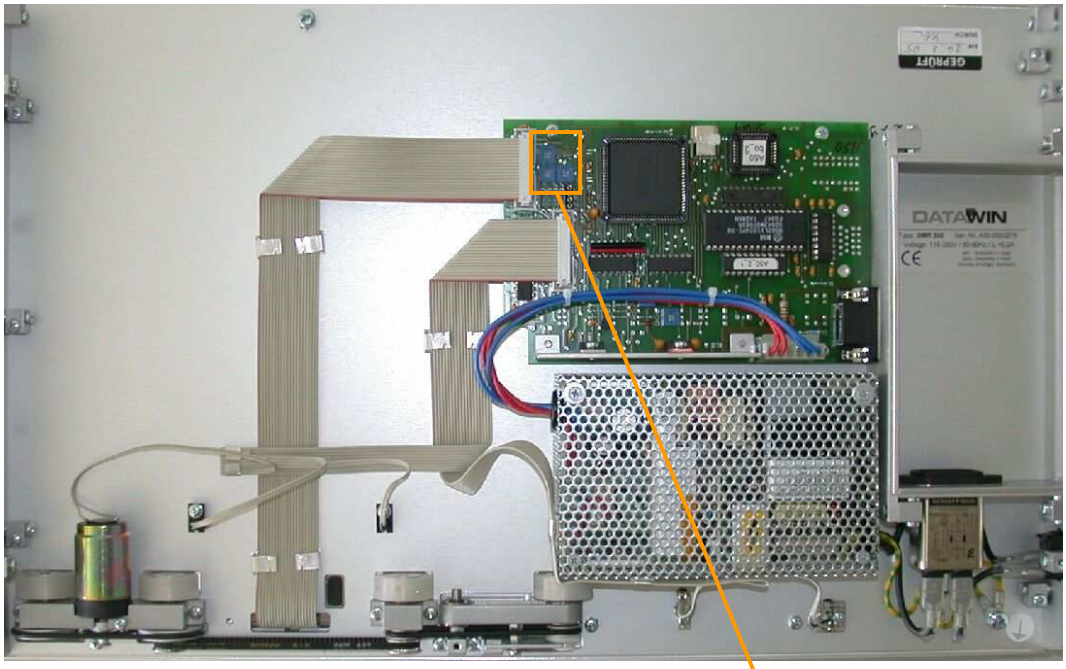
- Remove the rear panel of the housing (see section 6.1).
- Unplug all the plug connections of the CPU board. If necessary, make notes of the connections.
- Unscrew the three fastening screws and lift out the board.
- The steps in assembling the board are carried out in reverse order.

! Before replacing the rear panel of the housing check that all the connecting plugs are firmly connected.

- Remount the rear panel of the housing.

6.5.2 Setting the brightness values of the light barriers

The potentiometers for setting the brightness values for the light barriers (LB 1, LB 3 and LB 4) are located on the CPU board.



Tools:

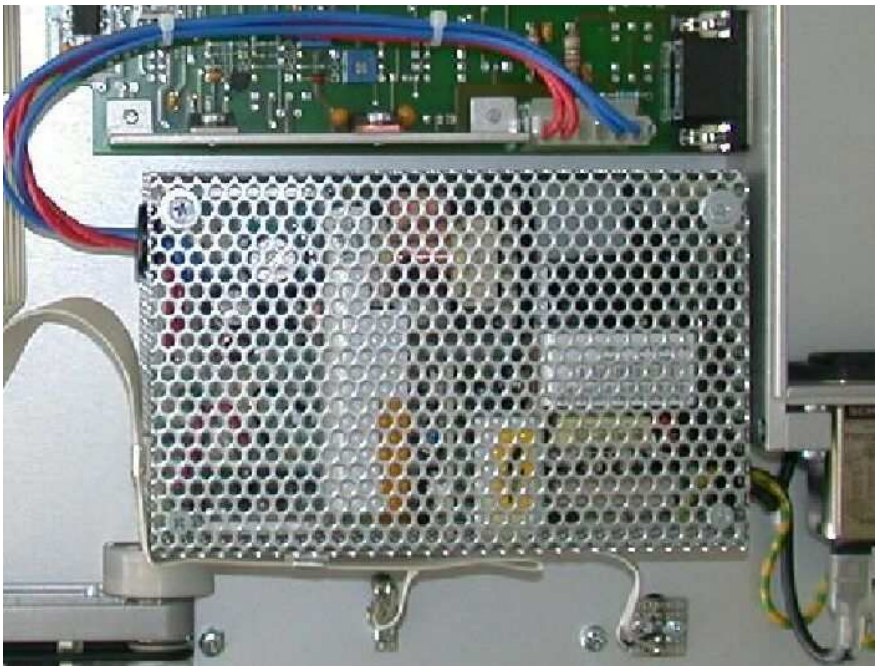
- cross-tip screwdriver (size 1)
- small flat screwdriver (for the potentiometer setting)

- ♦ Remove the rear panel of the housing (see section 6.1).
- ♦ The arrangement of the potentiometers is shown in the adjacent figure.
- ♦ Turn the reader on.

! Caution, be careful in handling live parts (high-voltage)!

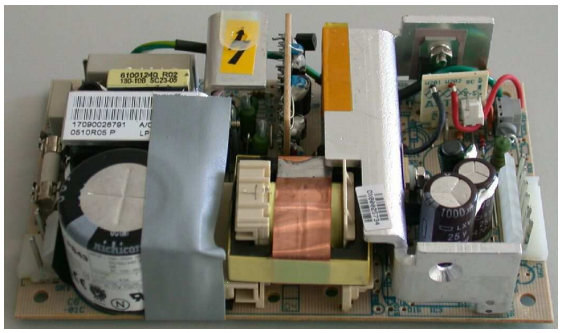
- ♦ Start the test program (see section 5.2.3.3) and by means of the respective potentiometer, set the correct value for each light barrier.
- ♦ After you have finished making the settings, turn the reader off again and replace the rear panel of the housing.

6.6 Disassembling and assembling the power supply



Tools: – cross-tip screwdriver (size 1)
– hexagon socket wrench 5.5 mm

Spare parts:



power supply ASTEC LPS43

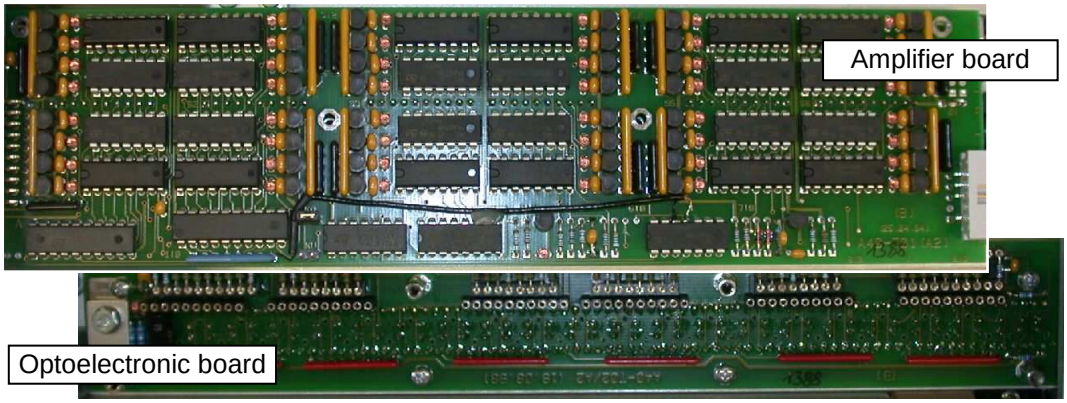
! Disconnect the power supply cable before you start working on the power supply!

How to replace the power supply:

- Remove the rear panel of the housing (see section 6.1).
- Unscrew the four screws that hold the power supply cage in place.
- Note the connected cables and disconnect the cable connections.
- Unscrew the four distance bolts and lift out the power supply.
- Insert the new power supply and reconnect all the cables according to the notes you made before, fastening the parts in reverse order.
- Replace the rear panel of the housing.

6.7 Working on the read head

The OMR read head (possibly as option also equipped with a bar code read head) consists of an optoelectronic board and an amplifier board. Service operations on the read head are limited to exchanging these two boards. The two boards are always replaced together, since they are tuned and electrically coordinated to one another.



Tools: – cross-tip screwdriver (size 1)
– hexagon socket wrench 4 mm

- Remove the upper cover plate (see section 6.1).
- Unplug all the plug connections of the amplifier board and remove the four screws in the upper part of the amplifier board.
- Carefully lift out the board towards the top. It is connected to the optoelectronic board lying below it by means of several pin connectors on its bottom side.
- Unscrew the four screws and the four distance bolts in the upper part of the optoelectronic board and lift the board out.
- Insert the new optoelectronic board but do not yet tighten the screws.
- Align the optoelectronic board: Before tightening the screws, be sure that the board is positioned exactly parallel in its installation space. Reference edge is the right side of the board.
- Fasten the optoelectronic board with the screws and distance bolts.
- Carefully insert the amplifier board. Be careful of the pin connectors on the bottom side of the board.
- Fasten the amplifier board with the four screws, reconnect all the leads and reattach the upper cover plate.

! Carry out the following tests before starting operation again:
– Test the lighting of the OMR read head (see section 5.2.3.2).
– Test the lateral setting of the OMR read head (see section 4.1.2).
– If present, test the setting of the bar code read head (see section 4.2).

Working on the lower read head

The replacement of the optional lower read head is carried out in principle exactly as that of the upper read head.

After mounting of the new lower read head, conduct the same tests as described above for the upper read head. In addition you must adjust and align both read heads with respect to one another.

7 Requirements on the documents

This chapter describes the requirements on the documents to be processed and provides tips on the marks to ensure smooth operation of the axm935.

7.1 External characteristics

Good quality of the documents to be processed is a necessary requirement in achieving good read results. Certain minimum requirements must therefore be observed.

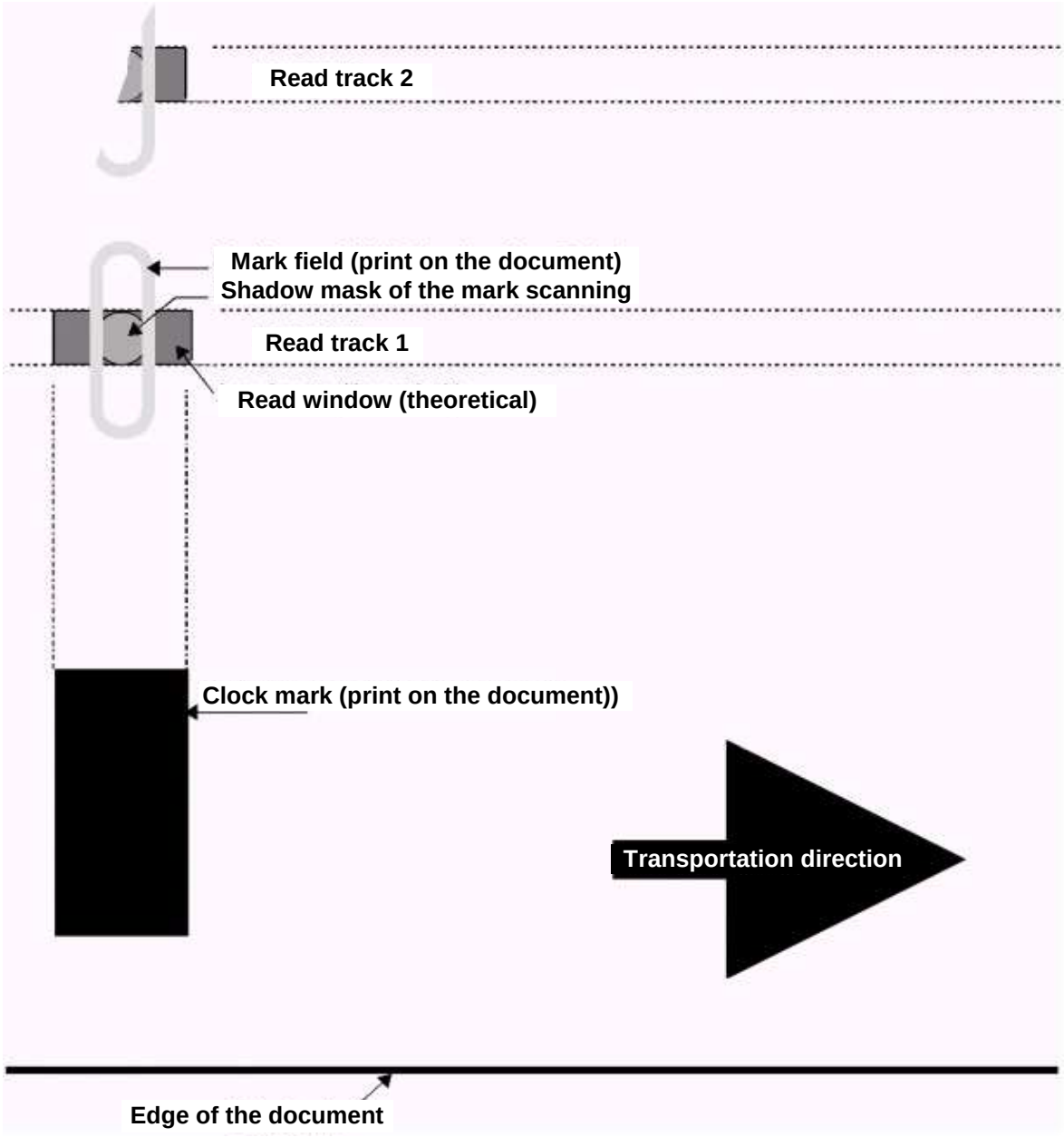
Prerequisite for the accurate scanning of the marks affixed to the documents is the correct and unimpaired document transport through the scanning equipment of the reader.

Moreover, the external characteristics of the documents to be read are important:

- Do not insert any wrinkled, rolled or folded documents into the reader.
  If necessary, smooth out the document beforehand and eliminate any dog-ears.
- The use of correction fluids is forbidden!
  Nevertheless, in the event that a document was treated with correction fluid, please assure that the fluid has dried completely. Otherwise there is danger that dirt may pass into the transportation mechanism and into the scanning unit which could lead to reading inaccuracies.
- Improperly glued bar code labels may also cause transportation disturbances. Therefore, please press down the edges of the labels firmly.

7.2 Prescriptions and recommendations concerning OMR marks

7.2.1 The mark field

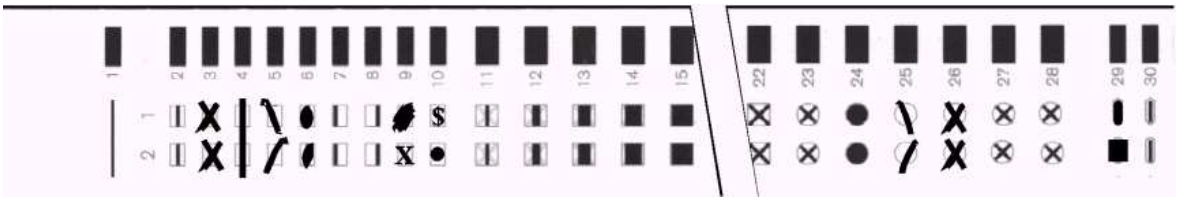

Read track 2
Mark field (print on the document)
Shadow mask of the mark scanning
Read track 1
Read window (theoretical)
Clock mark (print on the document))
Transportation direction
Edge of the document

The mark field identifies the position of the mark on the document. Inside the mark field the position of the scanning window is determined by

- the grid size of the mark scanning specified by the reader (here 1/5” interval from one read track to the next read track),
- the clock mark width (document design) and
- the size and form of the scanning mask (shadow mask).

7.2.2 Correct marks

A shadow mask with a diameter of 1 mm is used in the axm935. This ensures the exact separation of the individual tracks and at the same time it enables the acquisition of marking crosses. Moreover, because of the scanning that strongly emphasizes the middle section, miscut documents, off-center marks and marks that protrude are compensated for by means of generous tolerances. However, for this it is prerequisite that the entire mark field is utilized for the marks:



Both the position and the size of the read window can be influenced to a great extent by means of the parameterization of the reader in the interface program.

! As basic principle however, the following applies: a mark can be recognized **only** in the **read window** depicted above. Therefore, the better that the mark field is filled by the mark (bar, cross) across the entire length, the more accurately will this mark be recognized under unfavorable circumstances (unsteady document transport, documents cut or printed off straight). And also – the firmer the mark is, the more accurately can the automatic interference masking select a mark and distinguish it from surrounding document dirt.

7.2.3 Inadmissible marks

Several typical marking errors are displayed here:

! **Continuous marks are not permissible!**

A white interval of at least 1 mm must be maintained between the marks.

7.2.4 Reliable marking instruments

The table below shows which marking instruments are best suited for red light and infrared (option) scanning.

	Utilized Signal	
Marking instrument	**Infrared scanning**	**Red light scanning**
Pencil HB	very good	very good
Pencil H	good	good
Pentel marker	useless	very good
Staedler 318	useless	very good
Ball point pen black	dubious	good
Ball point pen blue	useless	good
Ball point pen green	useless	good
Ball point pen red	useless	useless
Endorsing ink violet	no signal	dubious
Endorsing ink blue	no signal	very good
Toner *	very good	very good
Printing ink *	very good	very good

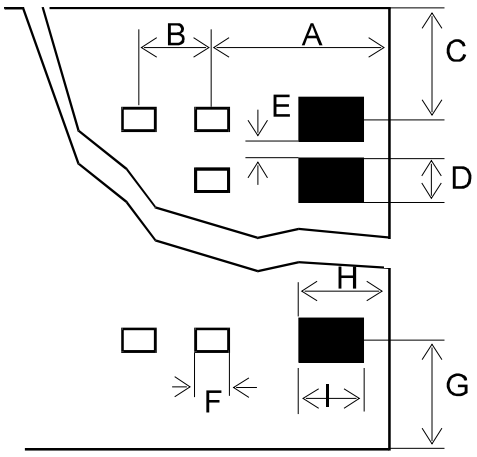
* for preprinted marks, e. g. document type

The clock mark is always scanned with infrared light, independent of the signal utilized by the mark scanning.

7.3 Axiome OMR document specifications

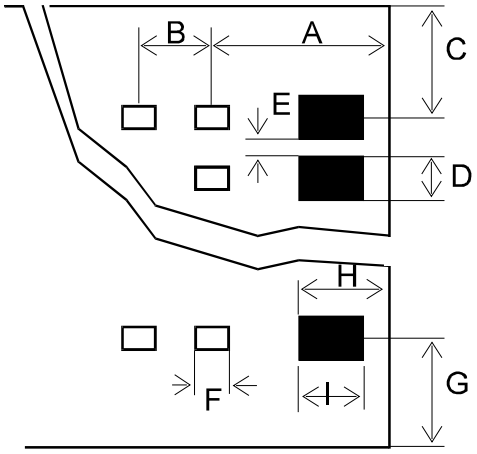
7.3.1 Standard document

Standard document 40 tracks, spacing 1/5"
(All dimensions in mm)



	min.	norm.	max.
A		13.97 [2])	
B		5.08	
C	10		
D	1		4
E	1.5 [1])		
F		3.0	
G	10		
H		7.62 [2])	
I		5.08	

Standard document 48 tracks, spacing 1/6"
(All dimensions in mm)



	min.	norm.	max.
A		11.43 [2])	
B		4.23	
C	10		
D	1		4
E	1.5 [1])		
F		3.0	
G	10		
H		8.89 [2])	
I		3.81	

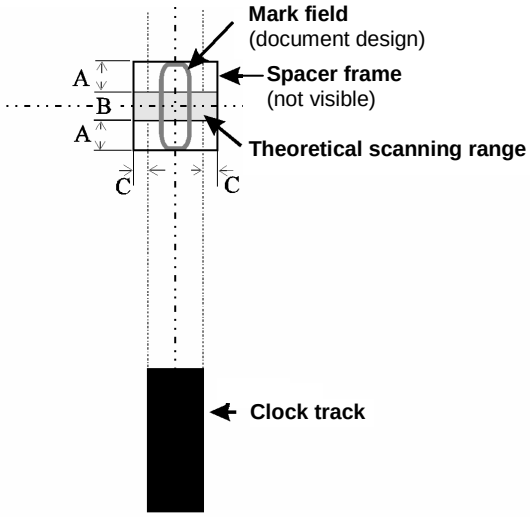
[1]) Can be smaller for special coding techniques, according to the manufacturer.
[2]) DATAWIN mark readers permit a scanning shift of -1 +3 mm.
However, the dimensions A and H must then deviate in the same direction and by the same values.

Document quality
Mechanical properties as per DIN 6723/6724
Optical features: OCR quality as per DIN 66223
PCS value for clock marks: > 60%

Document format
For all types of OMR: **length in transport direction > width!**

Type of reader	**Min. document** (mm)	**Max. document** (mm)	**Paper weight** (g/m^2) As per DIN 19307
OMR 50E	100 x 40	320 x 220	80 - 140

7.3.2 Scanning window



Dimensions: A = min. 1.0 mm
B = 1.0 mm
C = min. 0.5 mm

Marks (and readable print on documents) are recognized in the "theoretical scanning range" shown on the left.

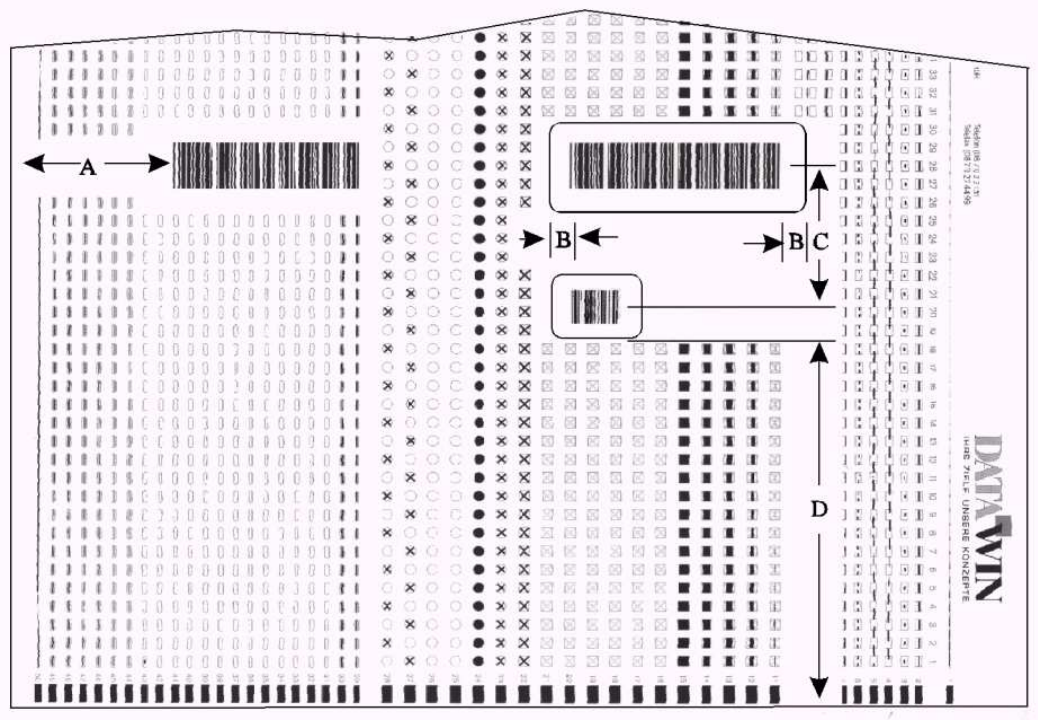
If no specific scanning procedures are used to mask black print (scan mode, window definition), it is recommended that no readable inscriptions and graphics be applied in the area of the displayed "spacer frame".

The spacer frame is dimensioned in such a manner that minor deviations in document design, cut and transport are compensated.

7.3.3 Bar codes labels and imprints

Dimension	Designation	Min. mm	Max. mm	Comment
A (s. sketch)	Distance to document end	35	–	Distance of last bar code module to document edge
B (s. sketch)	White margin	10	–	Area before the first and after the last bar code module that must be white or in blind print
C (s. sketch)	Distance between 2 bar code tracks	11	55	Only for "double bar code" option. Greater distances on request. Please note: the distance requested by the customer is set in the factory and cannot be changed.
D (s. sketch)	Distance to lower edge of the doc. – axm935	20	195	Distance of the bar code module to the lower edge of the document. The area of the clock marks must **always** remain free! * Possible in exceptional cases after consultation with the manufacturer

During the scanning of the bar code by the document reader, the bar code read head must be able to scan the whole bar code in at least one diagonal. Therefore it is best in any case to print the bar code as high as possible in order e. g. to be able to compensate gluing inaccuracies.



7.3.4 Permissible document colors for red light and infrared light scanning

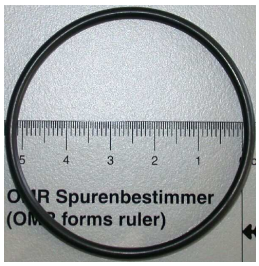
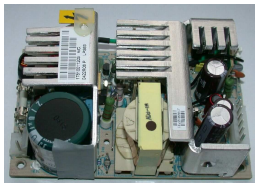
Measurements with blind colors of the ink manufacturer "Zeller & Gmelin"
(% specification corresponds to the blind color unwanted signal)

Scanning:	infrared light: 950 nm		red light: 635 nm	

Print color	Color no.	Value %	Comment	Value %	Comment
paper	white	< 1		< 1	
yellow	63376	3	good	4	still good
yellow	64400	3	good	4	still good
yellow	64401	< 1	very good	< 1	very good
orange	63079	2	very good	4	good
red	62429	2	very good	< 1	very good
red	63082	2	very good	4	still good
red	63112	2	very good	4	still good
red	65108	< 1	very good	< 1	very good
red	65204	< 1	very good	4	still good
red	65205	2	very good	4	still good
violet	63081	3	good	12	dubious
blue	62432	3	good	44	useless
blue	63893	2	very good	32	useless
blue	65107	2	very good	16	poor
blue-green	63892	3	good	44	useless
blue-green	65109	< 1	very good	24	useless
green	62431	3	good	48	useless
green	63483	< 1	very good	44	useless
green	63505	3	good	36	useless
green	64513	3	good	80	useless
yellow-green	63891	3	good	48	useless
brown	62433	4	still good	16	poor
brown shade (1 g/m^2)	18482	2	very good	24	useless
brown shade (2 g/m^2)	18482	2	very good	40	useless

The blind color "violet", classified under red light as "dubious" should be avoided if possible or only used after consultation with the manufacturer!

8 List of the wearing parts and the spare parts

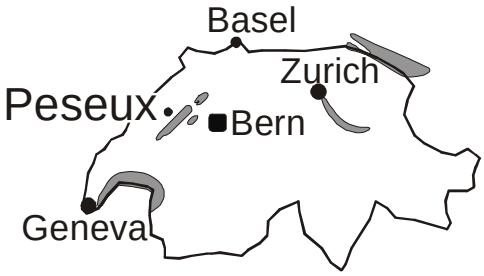
W/S	Article no.	Designation	Figure
W	01.002.02007	Round belt ATX 52 x 2.6 1 pc. (for drive motor)	
W	01.002.02005	Round belt ATX 40 x 2.6 1 pc. (for feed roller/swivel roller)	
S	01.002.05001	Toothed belt S2M-234 1 pc.	
S	01.004.01001	D.C. motor 2338S 012S with ball bearing 1 pc.	
S	02.007.02004	Power supply ASTEC LPS43 (12 V, 40 W) 1 pc.	
S	09.A50.00008	Cable harness with all light barrier component parts including 2 separate light barrier LEDs with plug connectors 1 pc.	
S	03.R08.00016	Silicone ring with lip and recess on the side (groove) for transport rollers, 24 mm 4 pcs.	

W/S	Article no.	Designation	Figure
S	07.A3300001	Counter-pressure roller, conical, 18 mm 1 pc.	
S	03.A60.00064	Counter-pressure roller, 18 mm 3 pcs.	

AXIOME Alpha SA
Rue du Chasselas 1
CH-2034 Peseux
Switzerland

e-mail: info@axiome.ch
http://www.axiome.ch

Tel. ++41 (0) 32 732 18 18
Fax. ++41 (0) 32 738 18 00



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